NORTHROP GRUMMAN

Tri-County Interoperable Consortium

Interoperable Communications Plan Needs Assessment

Submitted By:

Northrop Grumman

September 30, 2005

IT

5 Detailed Results

This section contains detailed findings from:

- Questionnaires
- Site Surveys
- Coverage Maps
- County Meetings
- Project Research
- Design Strategy
- Preliminary Design

5.1 Stakeholder Needs & Issues – Consortium-Wide

The next two sections contain pie charts depicting the results from the following two questions in the County Stakeholder Questionnaire:

List, in priority order, up to five (5) communications improvements needed from initial dispatch to call completion.

List, in priority order, up to five (5) factors that will be critical to future radio system in your county, city, or area of jurisdiction.

The results from each county were tabulated, with items given scores as follows:

An item listed as #1 received five points.
An item listed as #2 received four points.
An item listed as #3 received three points.
An item listed as #2 received two points.
An item listed as #5 received one point.

This point system allowed for weight to be given to those items higher in priority.

5.1.1 Communication Improvement Priorities – Consortium Wide

List, in priority order, up to five (5) communications improvements needed from initial dispatch to call completion.

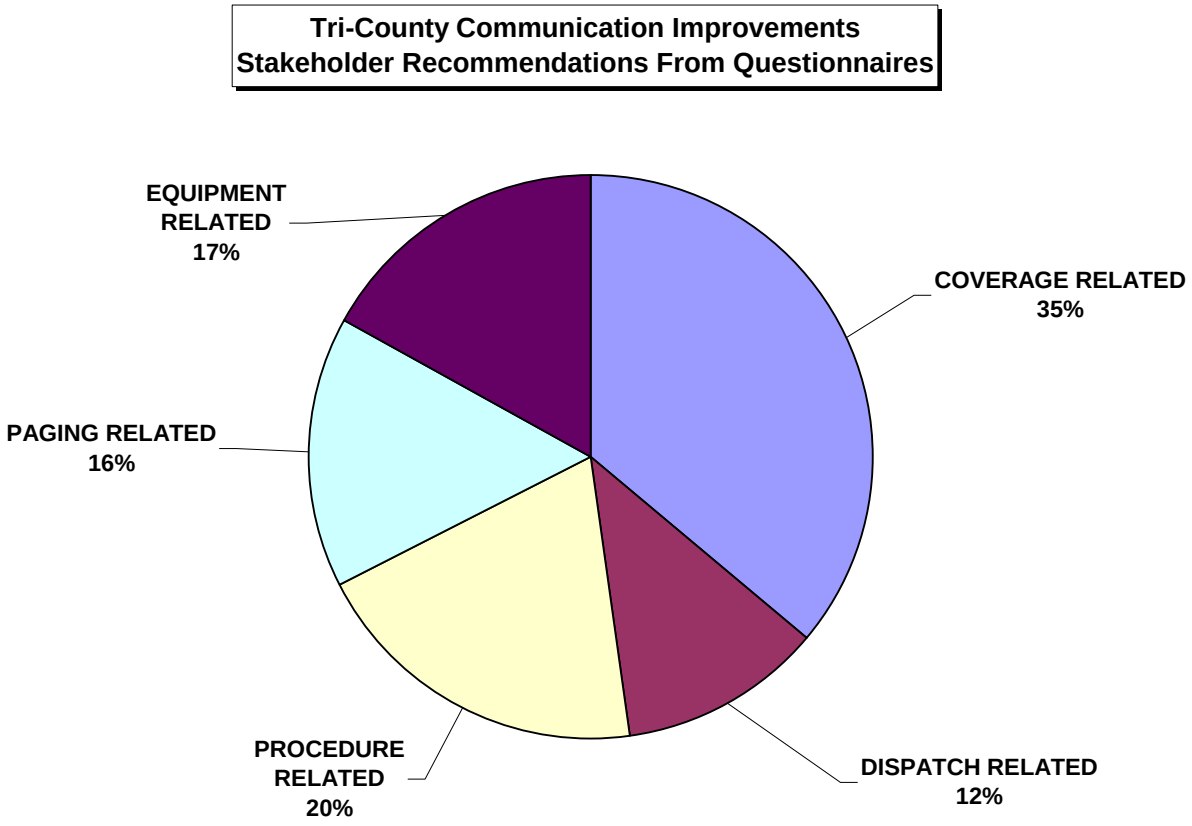

Figure 4 – Communications Improvements, TIC Total

Analysis

- Coverage is a factor for nearly everyone in the consortium. There are locations in each county where it is difficult to communicate with repeaters back to dispatch or to other responders.
- Business practices and procedures, of which dispatch is a part, are high on the list of what needs to be addressed. These are areas that do not require extensive funding to improve.
- Equipment is still a big issue for many, even without taking P25 into consideration. Several agencies either have no radios at all, or are functioning with radios that are 20 years old or more.

- Paging related improvements were not high on the list of concerns in meetings, but did show significant weight when the questionnaires were tabulated. This is an area that will need further investigation and potential solutions evaluated.

5.1.2 Factors for Success – Consortium Wide

List, in priority order, up to five (5) factors that will be critical to future radio system in your county, city, or area of jurisdiction.

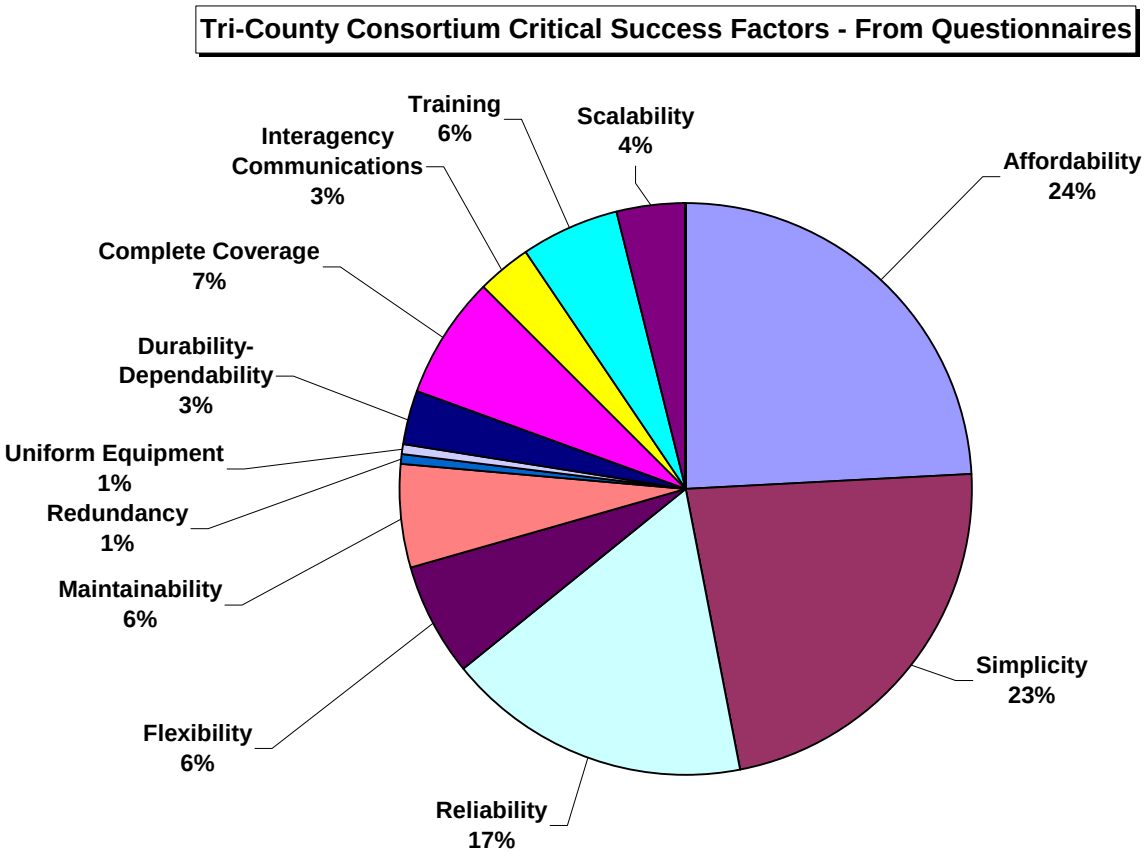

Figure 5 – Success Factors, TIC Total

Analysis

- Funding was one of the most discussed aspects in meetings. It was also shown to be important based on feedback in the questionnaires. Most, if not all of the counties in the TIC do not have a lot of money to spend on new equipment.
- Things need to be simple. Too much complexity and people will either not use it, or will forget how to use it. Many emergency responders are volunteers and do not have extensive training with radios. Also in emergencies, it is important that radio communication be as

simple as possible. The more pressure on a person, the more they rely on reaction. Many times, they do not have time to think through a scenario. Training on a new system will be a high priority before and during deployment as is indicated by a 6% rating response.

- The equipment needs to be reliable and easy to maintain. Again, emergency response requires that radio communications be there when you need it and many times that is during extremes. Durability is part of this category as well.
- There is some overlap in items on this list and on the Communications Improvements list. To the Project Manager, this indicates once again how important those particular Communication Improvements are.

5.1.3 Other Needs & Issues

This section contains those needs and issues, which are widespread throughout the consortium but not included in the sections above.

1. Dispatch is depended upon for support on all calls for service; however, agencies also use the same channel for tactical conversations, which overloads Dispatch with non-essential traffic. Because the Dispatch Center must monitor non-essential radio traffic, this leads to complaints that "Dispatch" is not answering the radio.

2. Inclusion of non-county stakeholders in all counties: During the course of the project, various non-county stakeholders were invited to meetings. These persons expressed thanks for being included and asked that they not be forgotten during the subsequent phases of the project.

3. Cellular telephones clearly play an important part in routine, emergency, and disaster response. It is not clear if those who noted their reliance on cell phones realize that cellular service may not be available to them during disaster response. It seems unlikely that a general loss of cell service in the area would not have a significant impact on the provision of public safety services; therefore, emergency responders should develop an interim plan to lessen their reliance on cellular phone services.

4. Training: During the process of gathering information from the counties, it became obvious that a large number of those who were required to use radios needed some training on how to use them more effectively. Sometimes this is simply a result of the fact that they do not use them very often, as in the case of a volunteer.

5. Communication systems must be changed to Narrowband by 2013, a mere 8 years from now.

5.1.4 Concerns

Some of the concerns documented in meetings include the following points.

Law enforcement and fire disciplines need hand held coverage in population centers and in building coverage.

Systems must be able to operate effectively in failure mode and that any new design incorporates failover capabilities.

Costs for a new system were always discussed.

Concern that the state would dictate how a new system would be developed and controlled. County agencies do not want to loose things like control over dispatch, the ability to control their communications infrastructure.

Nearly all meetings had discussions where users were concerned with a system that would become too complex and difficult to use.

Small counties are experiencing significant growth and the infrastructure and funding for emergency responders in not keeping pace. In some cases, county commissioners are decreasing funding to some agencies.

The fire community has a very strong need to operate in simplex mode.

5.2 Stakeholders, Needs & Issues By County

This section of the document contains the results from the information-gathering process within each county. **Important Note:** In many of the meetings held in individual counties, there were issues brought up which are not consortium issues, or issues that can or should be addressed at the consortium level. These concerns have all been documented in the meeting minutes from those meetings (which all appear in Appendix G to this document), but they may not be repeated or documented in this section. The concentration in this document was on items relevant to and addressable by the consortium.

5.2.1 Broadwater County

County Representative: Bill Fleiner
Number Of County Stakeholder Questionnaires Returned: 6
Number Of County Agencies Represented By Questionnaires: 6

5.2.1.1 Broadwater County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

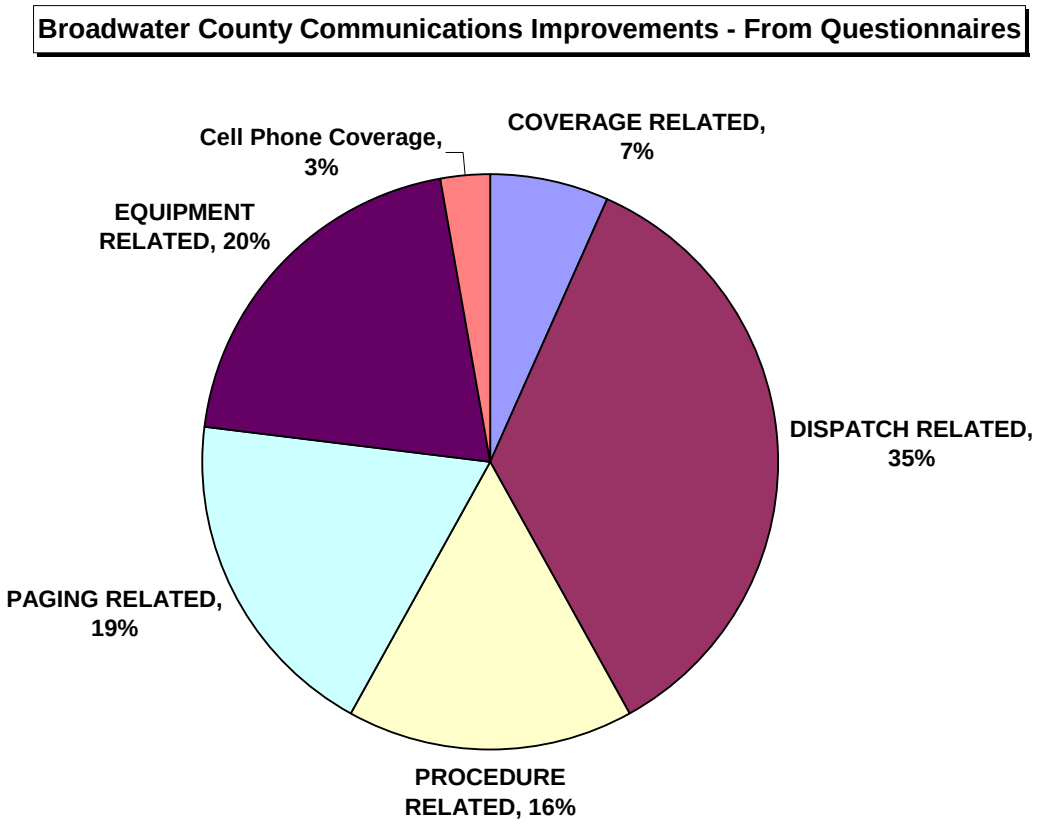

Figure 6 – Communications Improvements, Broadwater County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the Tri-County radio project to be successful.

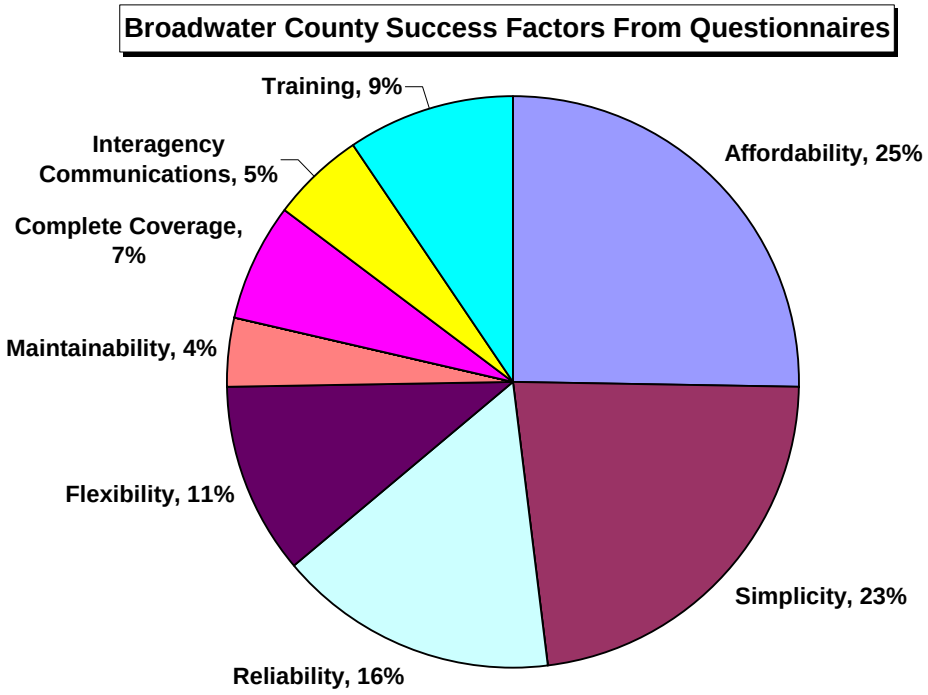

Figure 7 – Critical Success Factors, Broadwater County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the Tri-County radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.1.2 Broadwater County Agency Interactions

Broadwater County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Broadwater County EMTs	Broadwater Dispatch	Broadwater County Hospital	Broadwater County Sheriff's Office	Broadwater Fire Dept.	City of Townsend Fire Dept.	Three Forks Fire Dept.	Broadwater Co. Road Dept.	Townsend Schools	Broadwater DES	Broadwater Search & Rescue	City of Townsend	Lewis & Clark Co.Sheriff	Meagher Co.Sheriff	Jefferson Co.Sheriff	Gallatin Co.Sheriff	Montana Highway Patrol	Surrounding County S&R	Surrounding Hospitals	Forest Service	MDOT	FBI	BLM	FWP	DNRC	MT Army National Guard
Broadwater County EMTs																										
Broadwater Dispatch	A																									
Broadwater County Hospital	E	E																								
Broadwater County Sheriff's Office	E	A	E																							
Broadwater Fire Dept.	E	A	E	E																						
City of Townsend Fire Dept.	E	A	E	E	A																					
Three Forks Fire Dept.	E	E	E	E	E	E																				
Broadwater Co. Road Dept.	E	E	E	E	E	E	E																			
Townsend Schools	E	E	E	E	E	E	E	E																		
Broadwater DES	E	E	E	A	E	E	E	E	E																	
Broadwater Search & Rescue	E	A	E	A	E	E	E	E	E	E																
City of Townsend	E	E	E	E	E	E	E	E	E	E	E															
Lewis & Clark Co.Sheriff	E	E	E	E	E	E	E	E	E	E	E	E														
Meagher Co.Sheriff	E	E	E	E	E	E	E	E	E	E	E	E	E													
Jefferson Co.Sheriff	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
Gallatin Co.Sheriff	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E											
Montana Highway Patrol	E	A	E	A	E	E	E	E	E	E	E	E	E	E	E	E										
Surrounding County S&R	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E									
Surrounding Hospitals	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E								
Forest Service	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E							
MDOT	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E						
FBI	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E					
BLM	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E				
FWP	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
DNRC	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
MT Army National Guard	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	

Figure 8 – Agency Interactions, Broadwater County

5.2.2 Jefferson County

County Representative: Sally Buckles
Number Of County Stakeholder Questionnaires Returned: 18
Number Of County Agencies Represented By Questionnaires: 12

5.2.2.1 Jefferson County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

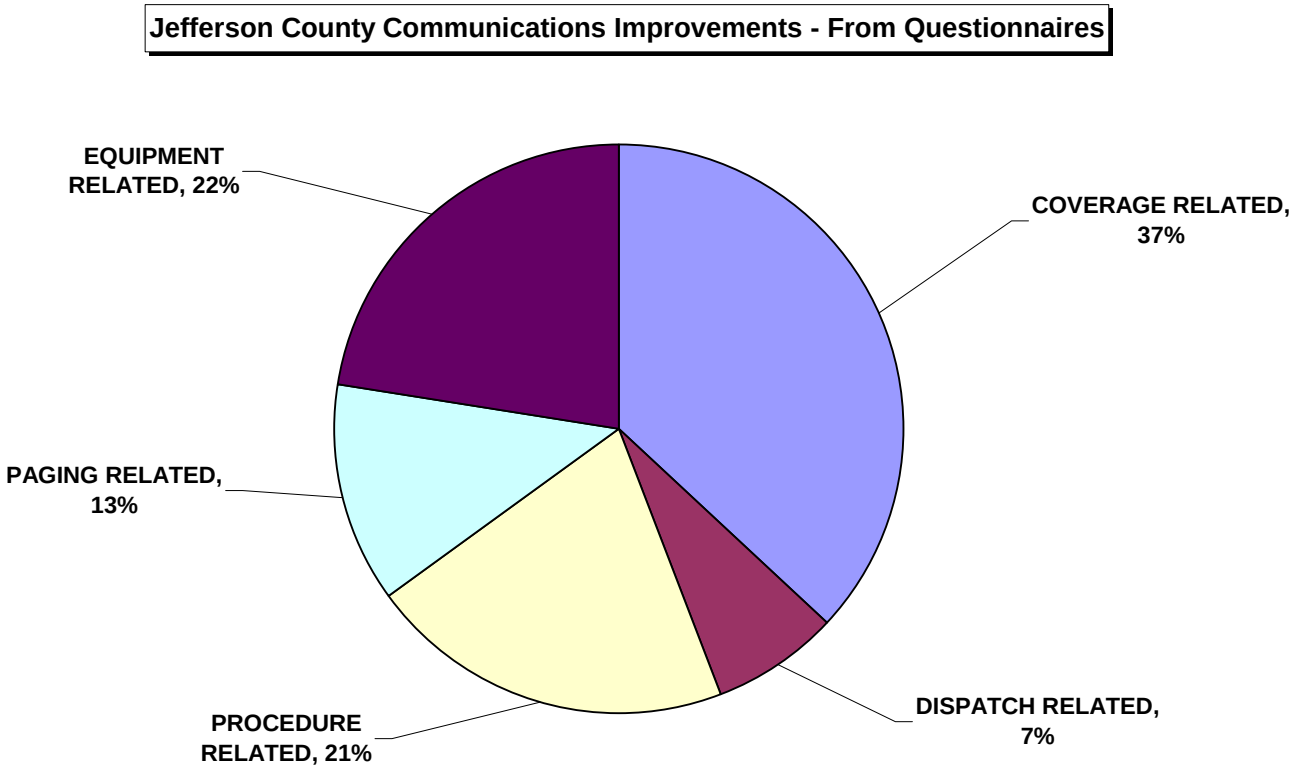

Figure 9 – Communications Improvements, Jefferson County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the Tri-County radio project to be successful.

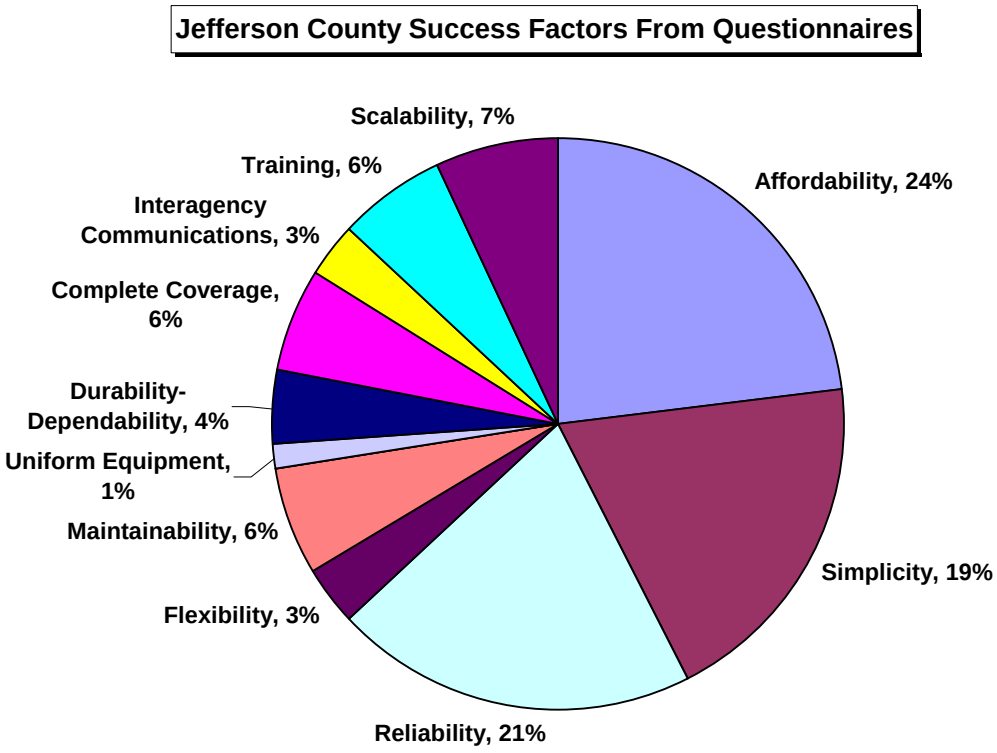

Figure 10 – Critical Success Factors, Jefferson County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the Tri-County radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.2.2 Jefferson County Interactions

Jefferson County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Boulder Ambulance	Whitehall Ambulance	Eagle Emergency Services	Boulder Dispatch	Jefferson County Sheriff's Office	Jefferson County Fire Dept.	Boulder Police Dept.	Whitehall/Jefferson Valley VFD	Montana City VFD	Jefferson City VFD	Clancy VFD	Elk Park VFD	Jefferson Valley Search & Rescue	Elkhorn Search & Rescue	Jefferson DES	Lewis & Clark Co.Sheriff	Montana Highway Patrol	Surrounding County S&R	Forest Service	MDOT	FBI	BLM	FWP	DNRC	MT Army National Guard	Wrecker Services	Whitehall Dispatch	Lewis & Clark Co. Fire Departments	Broadwater Co. Fire Departments	Helena Police Dept.	Madison County Agencies	A-1 Ambulance	Butte/Silver Bow Agencies	Three Forks Ambulance	Willow Creek VFD	Montana State Parks	Golden Sunlight Mine	Whitehall Schools	Harlow Bus Service
Boulder Ambulance																																					
Whitehall Ambulance	E																																				
Eagle Emergency Services	E	E																																			
Boulder Dispatch	E	A	E																																		
Jefferson County Sheriff's Office	A	A	A	A																																	
Jefferson County Fire Dept.	E	E	E	E	E																																
Boulder Police Dept.	A	E	E	A	A	A																															
Whitehall/Jefferson Valley VFD	E	E	E	E	E	E	E																														
Montana City VFD	E	E	E	A	A	A	E	A																													
Jefferson City VFD	E	E	E	A	A	E	E	E	A																												
Clancy VFD	E	E	E	E	A	E	E	E	A	E																											
Elk Park VFD	E	E	E	E	A	E	E	E	E	E	E																										
Jefferson Valley Search & Rescue	E	E	E	E	E	E	E	E	E	E	E	E																									
Elkhorn Search & Rescue	E	E	E	E	E	E	E	E	E	E	E	E	E																								
Jefferson DES	E	E	E	E	E	E	E	E	E	E	E	E	E	E																							
Lewis & Clark Co.Sheriff	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E																						
Montana Highway Patrol	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																					
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Forest Service	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																			
MDOT	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																		
FBI	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																	
BLM	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E																
FWP	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E															
DNRC	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E														
MT Army National Guard	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E													
Wrecker Services	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
Whitehall Dispatch	E	A	E	A	A	E	E	A	E	E	E	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E											
Lewis & Clark Co. Fire Departments	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E										
Broadwater Co. Fire Departments	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E									
Helena Police Dept.	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E								
Madison County Agencies	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E							
A-1 Ambulance	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E						
Butte/Silver Bow Agencies	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E					
Three Forks Ambulance	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E				
Willow Creek VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
Montana State Parks	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
Golden Sunlight Mine	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	
Whitehall Schools	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Harlow Bus Service	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E

Figure 11 – Agency Interactions, Jefferson County

5.2.3 Powell County

County Representative: Bart Barton
Number Of County Stakeholder Questionnaires Returned: 11
Number Of County Agencies Represented By Questionnaires: 11

5.2.3.1 Powell County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

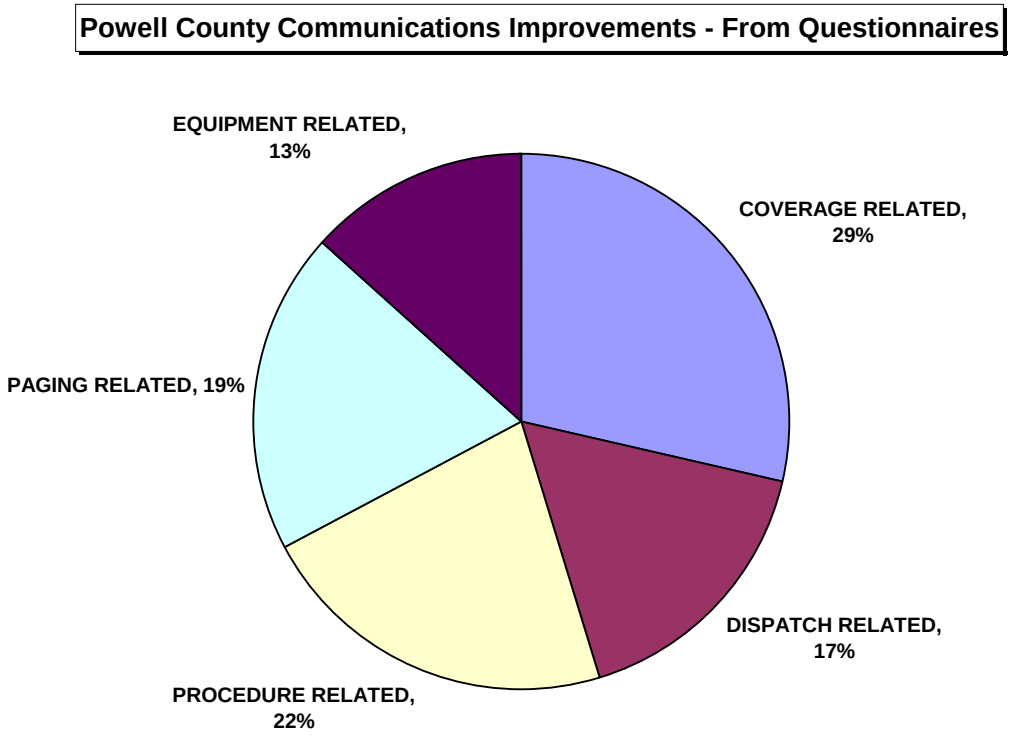

Figure 12 – Communications Improvements, Powell County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the Tri-County radio project to be successful.

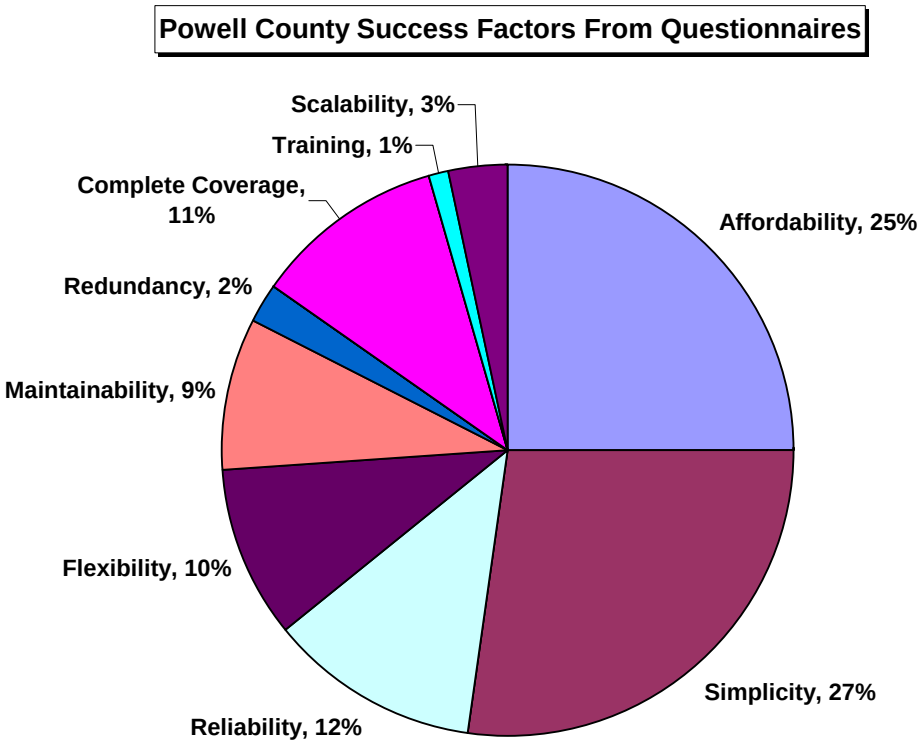

Figure 13 – Critical Success Factors, Powell County

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the Tri-County radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.3.2 Powell County Interactions

Powell County

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Powell County Sheriff's Office	Powell County Dispatch	Powell County Fire Services	Powell County Search and Rescue	Powell County Road Dept.	Powell County DES	Powell County Ambulance	Lewis & Clark Co.Sheriff	Montana Highway Patrol	Surrounding County S&R	Forest Service	MDOT	FBI	BLM	FWP	DNRC	Powell County Hospital	Life Flight	Ovando VFD	Deer Lodge VFD	Racetrack VFD	Garrison VFD	Avon VFD	Elliston VFD	St. Peters Hospital	Helmville VFD	Drommond VFD
Powell County Sheriff's Office																											
Powell County Dispatch	A																										
Powell County Fire Services	E	A																									
Powell County Search and Rescue	E	A	E																								
Powell County Road Dept.	E	E	E	E																							
Powell County DES	E	E	E	A	E																						
Powell County Ambulance	A	A	E	E	E	E																					
Lewis & Clark Co.Sheriff	E	E	E	E	E	E	E																				
Montana Highway Patrol	E	E	E	E	E	E	E	E																			
Surrounding County S&R	E	E	E	E	E	E	E	E	E																		
Forest Service	E	E	E	E	E	E	E	E	E	E																	
MDOT	E	E	E	E	E	E	E	E	E	E	E																
FBI	E	E	E	E	E	E	E	E	E	E	E	E															
BLM	E	E	E	E	E	E	E	E	E	E	E	E	E														
FWP	E	E	E	E	E	E	E	E	E	E	E	E	E	E													
DNRC	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
Powell County Hospital	E	E	E	E	E	E	A	E	E	E	E	E	E	E	E	E											
Life Flight	E	E	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E										
Ovando VFD	A	A	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E									
Deer Lodge VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E								
Racetrack VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E							
Garrison VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E						
Avon VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E					
Elliston VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E				
St. Peters Hospital	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
Helmville VFD	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		
Drommond VFD	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	

Figure 14 – Agency Interactions, Powell County

5.2.4 Department of Corrections

Agency Representative: Dave Shaw
Number Of Agency Stakeholder Questionnaires Returned: 2
Number Of Agency Agencies Represented By Questionnaires: 2

5.2.4.1 Powell County Concerns or Issues

1. Communications Improvements

The following pie chart depicts the communications improvements desired by the responding stakeholders in this county:

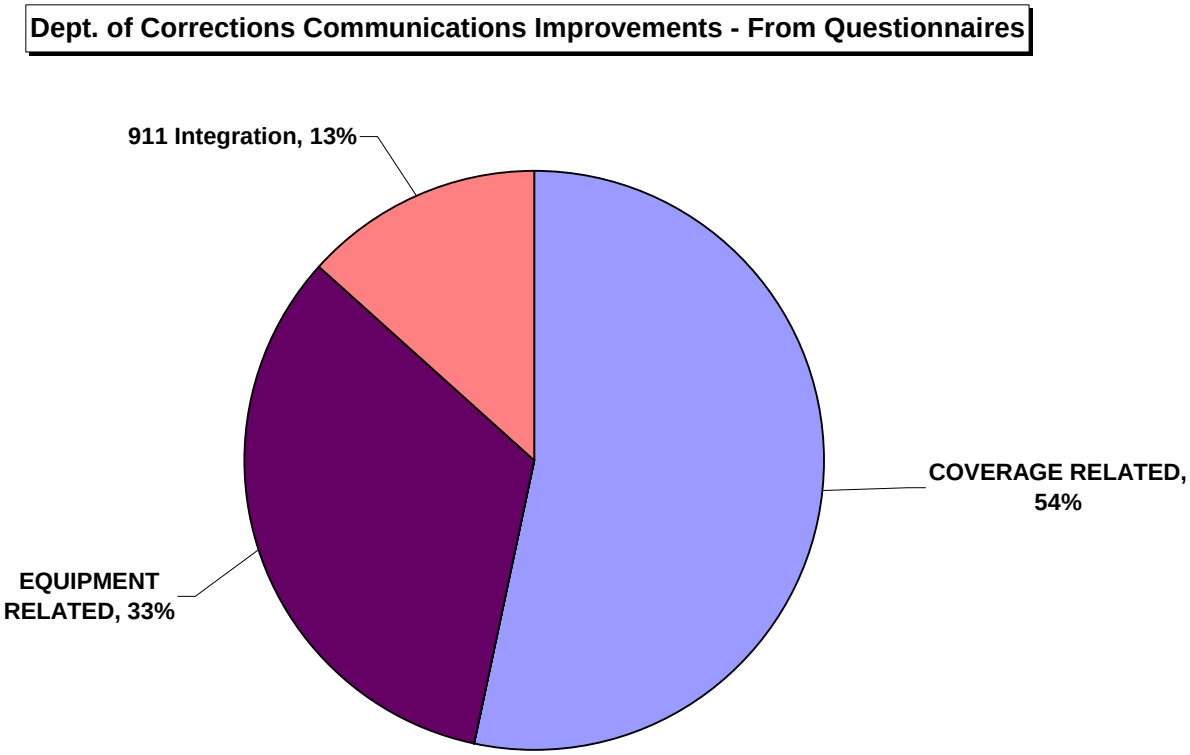

Figure 15 – Communications Improvements, Dept. of Corrections

How to read this chart:

Stakeholders were asked to list, in priority order, the top five communications improvements they would like to see. Those items ranked higher were given a higher point value than those ranked lower. A percentage was then calculated. If the chart contains less than five "wedges," this means the stakeholders did not list the full five possible items.

2. Success Factors

The following chart depicts the success factors considered critical by the responding stakeholders in this county in order for the Tri-County radio project to be successful.

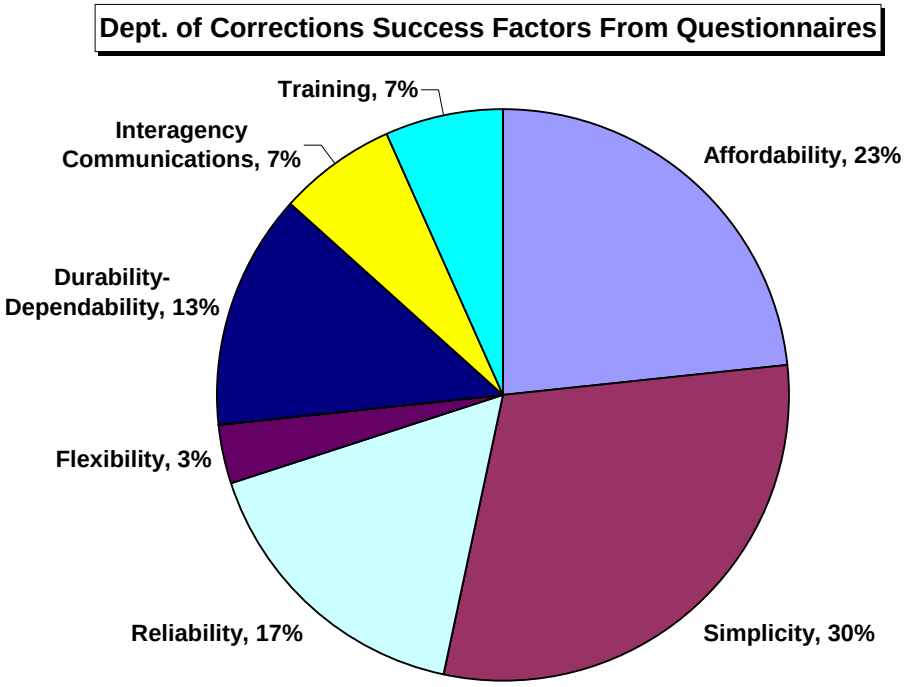

Figure 16 – Critical Success Factors, Dept. of Corrections

How to read this chart:

Stakeholders were asked to list, in priority order, the top five factors they felt were most necessary for the Tri-County radio project to be successful. Those items ranked higher were given a higher point value than those ranked lower, in order to give higher-ranked items more weight. A percentage for each item was then calculated. If the chart contains less than five items ("wedges"), this indicates the stakeholders did not list the full five possible items.

Some of the same items often appear in both the communications improvements chart and the critical success factors chart. This indicates that these items are very important to the stakeholders.

5.2.4.2 Powell County Interactions

Dept. of Corrections

Key:
E - Emergency Basis Only
A - Administrative & Emergency Basis

	Montana State Prison	All County Sheriff's Offices	Montana State Prison Ranch	Montana State Prison Industries	MHP	All State Law Enforcement Agencies	DNRC	State and Local DES	Forest Service	Powell County Search and Rescue	Local Fire Departments	Powell County Hospital	Powell County Ambulance	Transcor	Treasure State Correctional Training		
Montana State Prison																	
All County Sheriff's Offices	A																
Montana State Prison Ranch	A	E															
Montana State Prison Industries	A	E	E														
MHP	A	E	E	E													
All State Law Enforcement Agencies	A	E	E	E	E												
DNRC	E	E	E	E	E	E											
State and Local DES	E	E	E	E	E	E	E										
Forest Service	E	E	E	E	E	E	E	E									
Powell County Search and Rescue	E	E	E	E	E	E	E	E	E								
Local Fire Departments	E	E	E	E	E	E	E	E	E	E							
Powell County Hospital	E	E	E	E	E	E	E	E	E	E	E						
Powell County Ambulance	E	E	E	E	E	E	E	E	E	E	E	E					
Transcor	A	E	E	E	E	E	E	E	E	E	E	E	E				
Treasure State Correctional Training	A	E	E	E	E	E	E	E	E	E	E	E	E	E			

Figure 17 – Agency Interactions, Department of Corrections

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Existing Physical Infrastructure

The following site map displays all sites with:

existing site coverage shown in yellow

dead spots or areas where radio coverage is a concern shown in blue

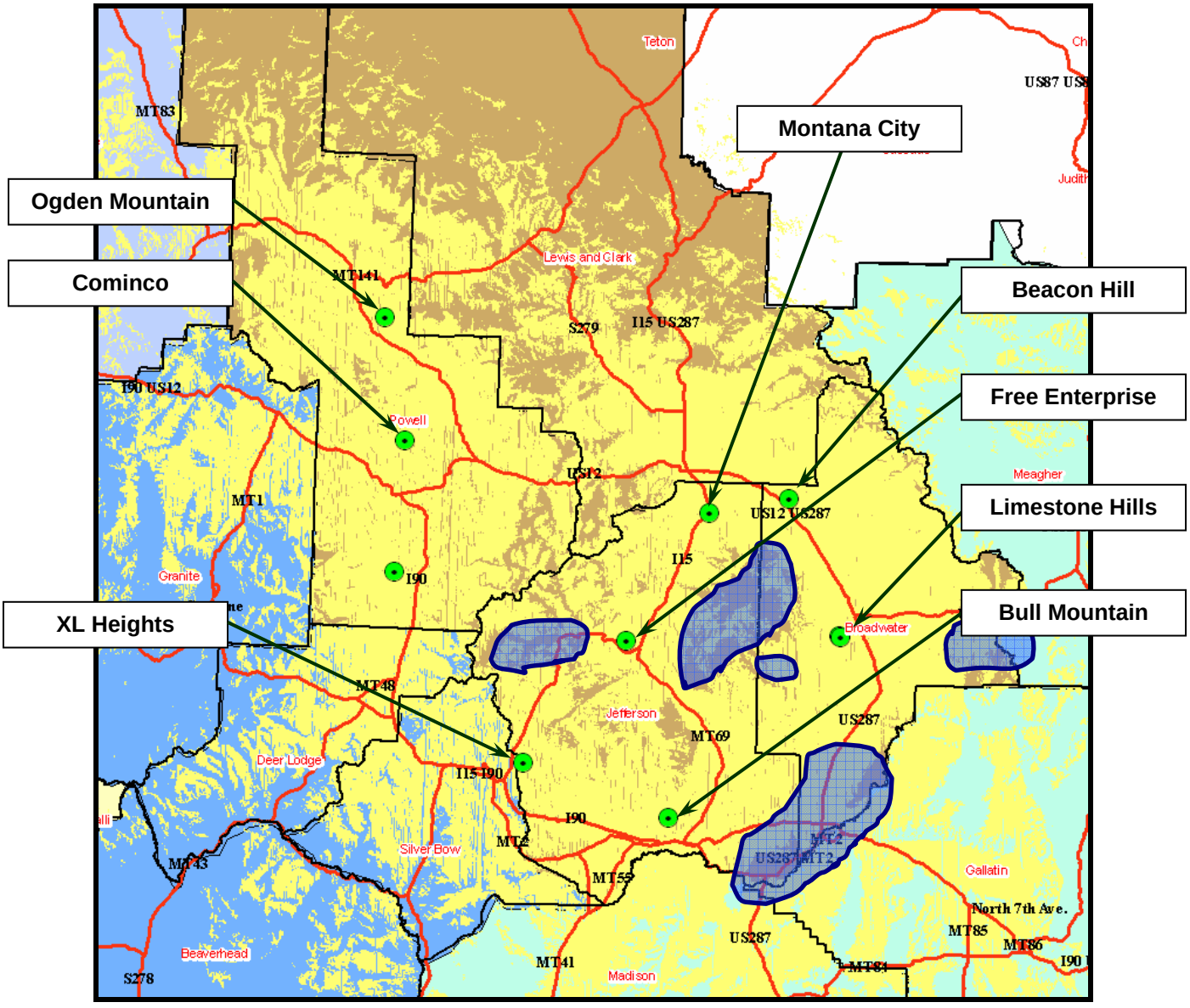

Figure 18 – Site Map: Consortium-Wide

These dead spots are very roughly drawn. They are primarily to indicate that there are some coverage issues within a general area and are not to be taken as indicating no coverage throughout an area.

5.3 Site Surveys By Site

5.3.1 Beacon Hill

Site Pictures

Site Description:

This site is an old aviation beacon tower with poor electrical, building and tower capabilities. The recommendation is to leave this conventional unless further analysis and need arise to justify investment in the site.

Area:

In Broadwater County, near Winston, right off of highway 287

Owner:

Dept. of Transportation – Aeronautics Division

Elevation:

5400 ft.

Latitude:

46 32' 33.8"

Longitude:

111 42' 40.9"

Tower:

Old FAA beacon tower, still in use. Poor structural capability

Building Type:

Small wood frame, steel siding

Building Size:

4'x4'

List of Users at this site:

- Broadwater County Road Dept.

Radios at this site:

- Broadwater County Sheriff

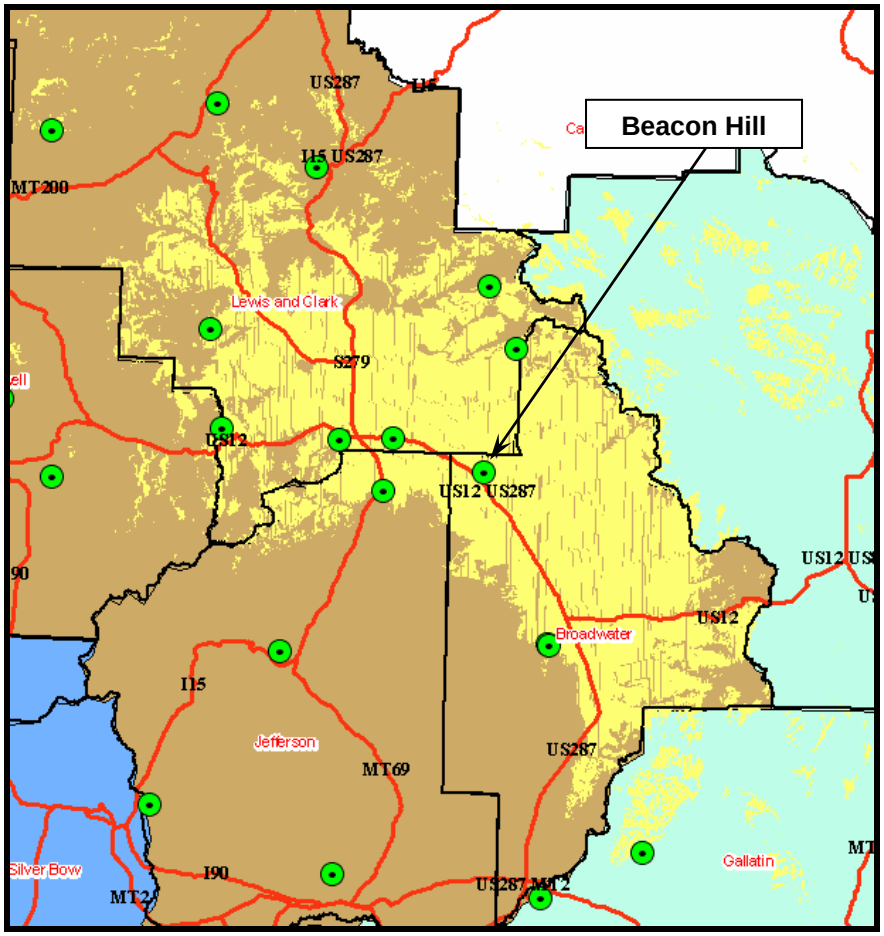

Figure 19 – Coverage Map: Beacon Hill

5.3.2 Prison Hill

Site Pictures

Site Description:

The site is in poor condition overall and would require significant upgrades. It has good coverage over the prison facility including in building coverage as well as general cover over the city of Deer Lodge.

Area:

Deer Lodge area

Owner:

Montana State Prison

Elevation:

5055 ft.

Latitude:

46 22' 33.9"

Longitude:

112 48' 17.3"

Tower:

Guyed angle iron tower, roughly 100 ft. and is bowed, not structurally sound

Building Type:

Wooden structure

Building Size:

6'x8'

List of Users at this site:

- Anaconda based ISP

Radios at this site:

-

Coverage Map

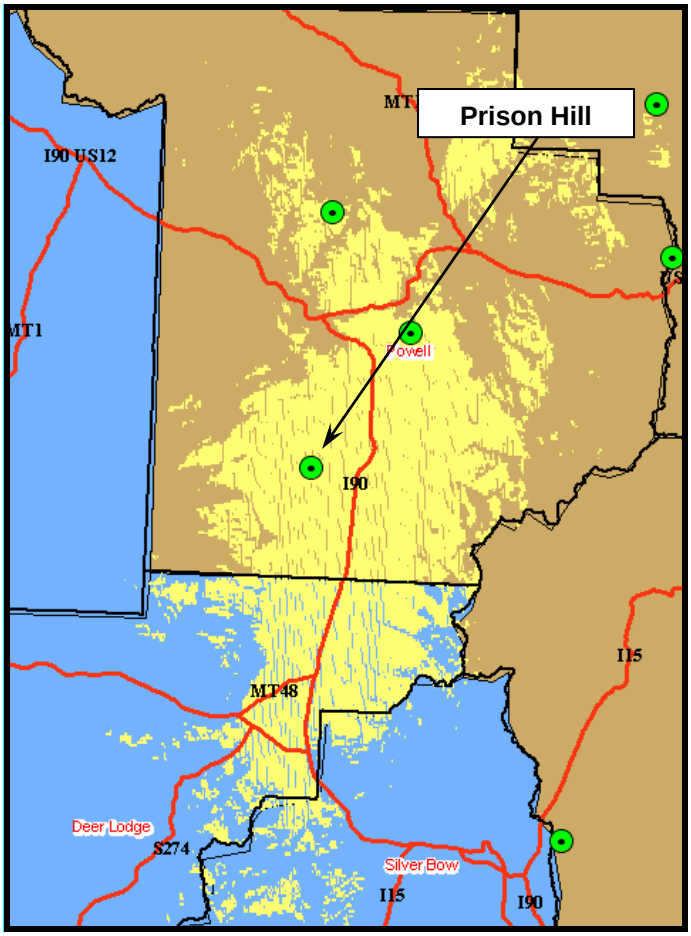

Figure 20 – Coverage Map: Prison Hill

5.3.3 Cominco

Site Pictures

Site Description:

The site was built by the Powell County Sheriff's Office a few years ago and has good coverage over the valley as well as over the Avon, Ovando areas.

Area:

Located just north of Garrison on the Cominco Mine property.

Owner:

Cominco Mine

Elevation:

6787 ft.

Latitude:

46 37' 45.0"

Longitude:

112 47' 21.8"

Tower:

Roughly 100 ft. guyed tower. Good condition

Building Type:

Old Air Force surplus semi trailer. Metal construction. May require upgrade

Building Size:

10'x30'

List of Users at this site:

- Powell County Sheriff
-

Radios at this site:

- Powell County Sheriff

Coverage Map

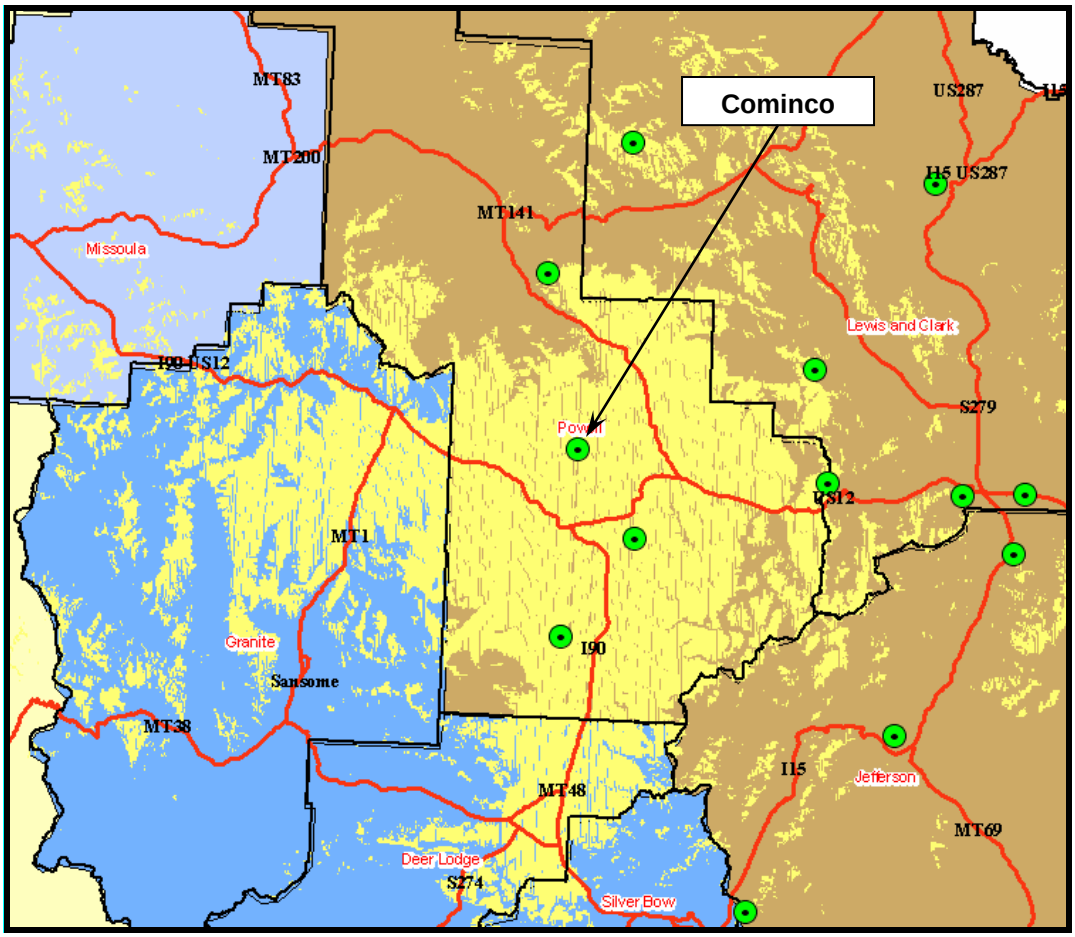

Figure 21 – Coverage Map: Cominco

5.3.4 Ogden Mountain

Site Pictures

Site Description:

This is a Burlington Northern site, which requires a BN employee to be there for access to the building. Very close to Stonewall as Lincoln is on the other side of the mountain from Helmville.

Area:

Mountaintop to the east of Helmville in Powell County

Owner:

Burlington Northern Railroad

Elevation:

6371 ft.

Latitude:

46 51' 51.9

Longitude:

112 51' 41.7"

Tower:

Very heavy duty guyed tower – 140 ft.

Building Type:

Cinder block

Building Size:

10’x15’

List of Users at this site:

- Burlington Northern Railroad
- Powell County Sheriff

Radios at this site:

-

Coverage Map

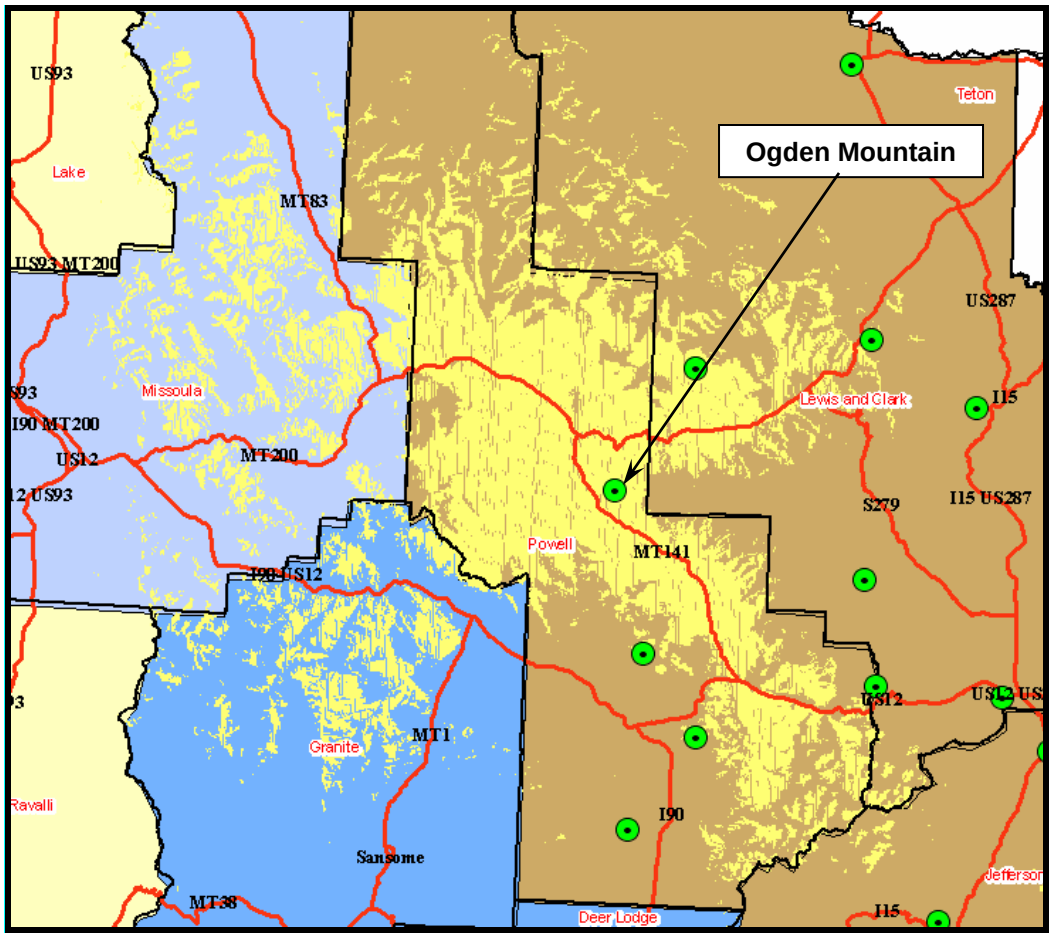

Figure 22 – Coverage Map: Ogden Mountain

5.3.5 Free Enterprise

Site Pictures

Site Description:

The site overlooks Boulder but has a very limited tower. As can be seen in the picture on the right, there is an excellent cell tower adjacent to the building.

Area:

Just to the west of Boulder in Jefferson County

Owner:

Jefferson County

Elevation:

5958 ft.

Latitude:

46 15' 33.9"

Longitude:

112 09' 11.4"

Tower:

Rohn 25 or similar, about 40 ft. high

Building Type:

Cinder block

Building Size:

7'x7'

List of Users at this site:

- Jefferson County Sheriff

Radios at this site:

-

Coverage Map

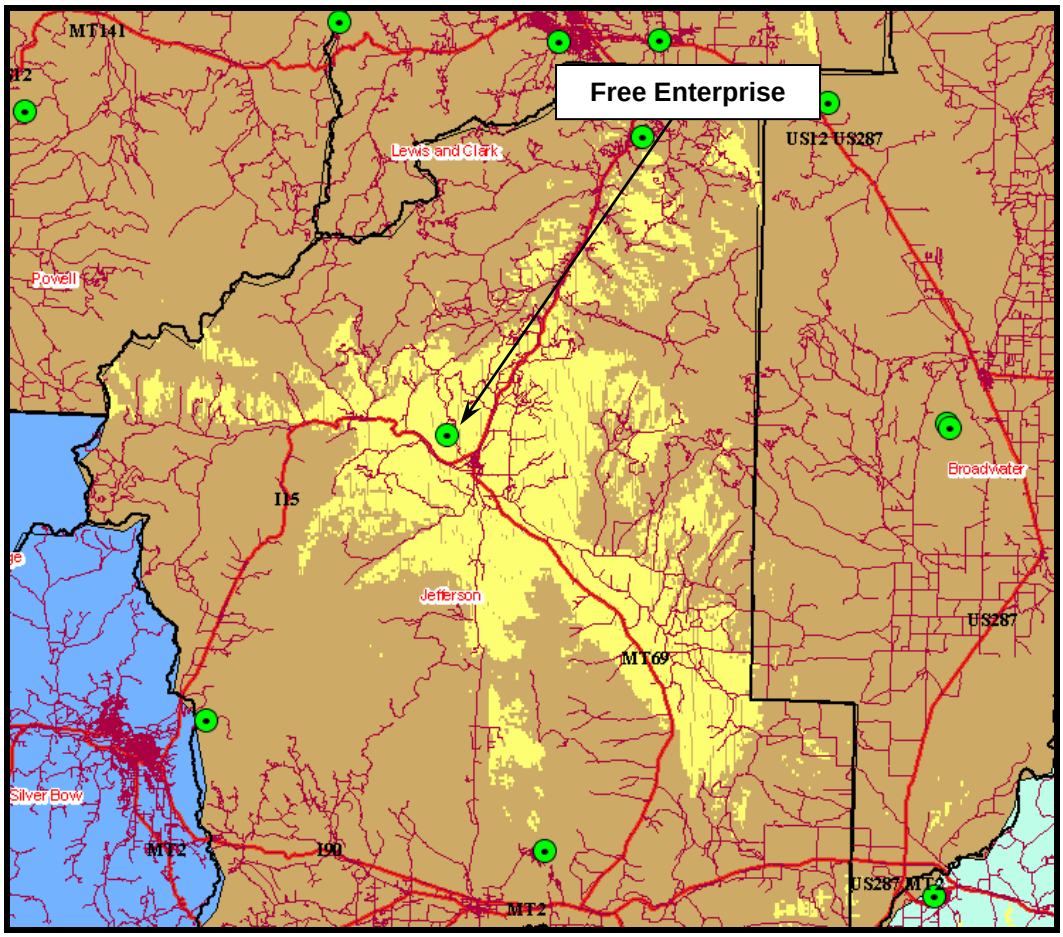

Figure 23 – Coverage Map: Free Enterprise

5.3.6 Bull Mountain

Site Pictures

No Site Images Available at this time.

Site Description:

Bull Mountain Site is owned by BLM with public safety users occupying space at the site.

Area:

Bull Mountain near the Golden Sunlight mine north and east of Whitehall.

Owner:

BLM

Elevation:

6550 ft.

Latitude:

45 55’ 14”

Longitude:

112 01’ 18”

Tower:

60 ft. – needs additional height

Building Type:

Pre-fab communications shelter

Building Size:

10’x12’

List of Users at this site:

- BLM
- MHP
- Jefferson County Sheriff
- others

Radios at this site:

-

Coverage Map

(image on next page)

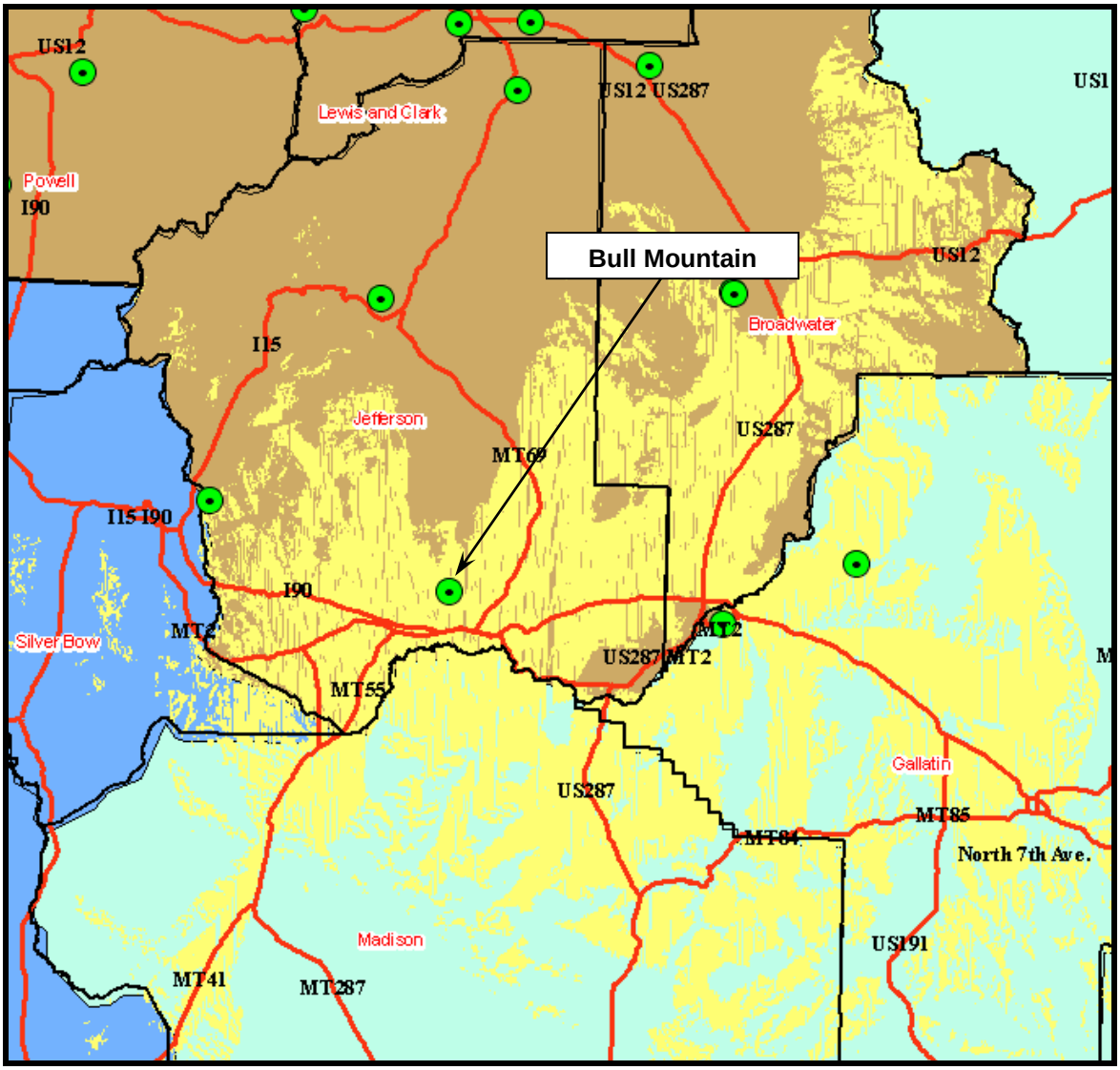

Figure 24 – Coverage Map: Bull Mountain

5.3.7 XL Heights

Site Pictures

Site Description:

Area:
XL Heights is on the mountain to the east of Butte and slightly north of Lady of the Rockies.

Owner:
Montana Highway Patrol

Elevation:
8103 ft.

Latitude:
46 01' 02.7"

Longitude:
112 25' 37.4"

Tower:
Free standing at about 30ft. Possibly able to increase height.

Building Type:
Cinder block

Building Size:
15'x30'

List of Users at this site:

- Montana Highway Patrol

- Jefferson County Sheriff's Office

Radios at this site:

-

Coverage Map

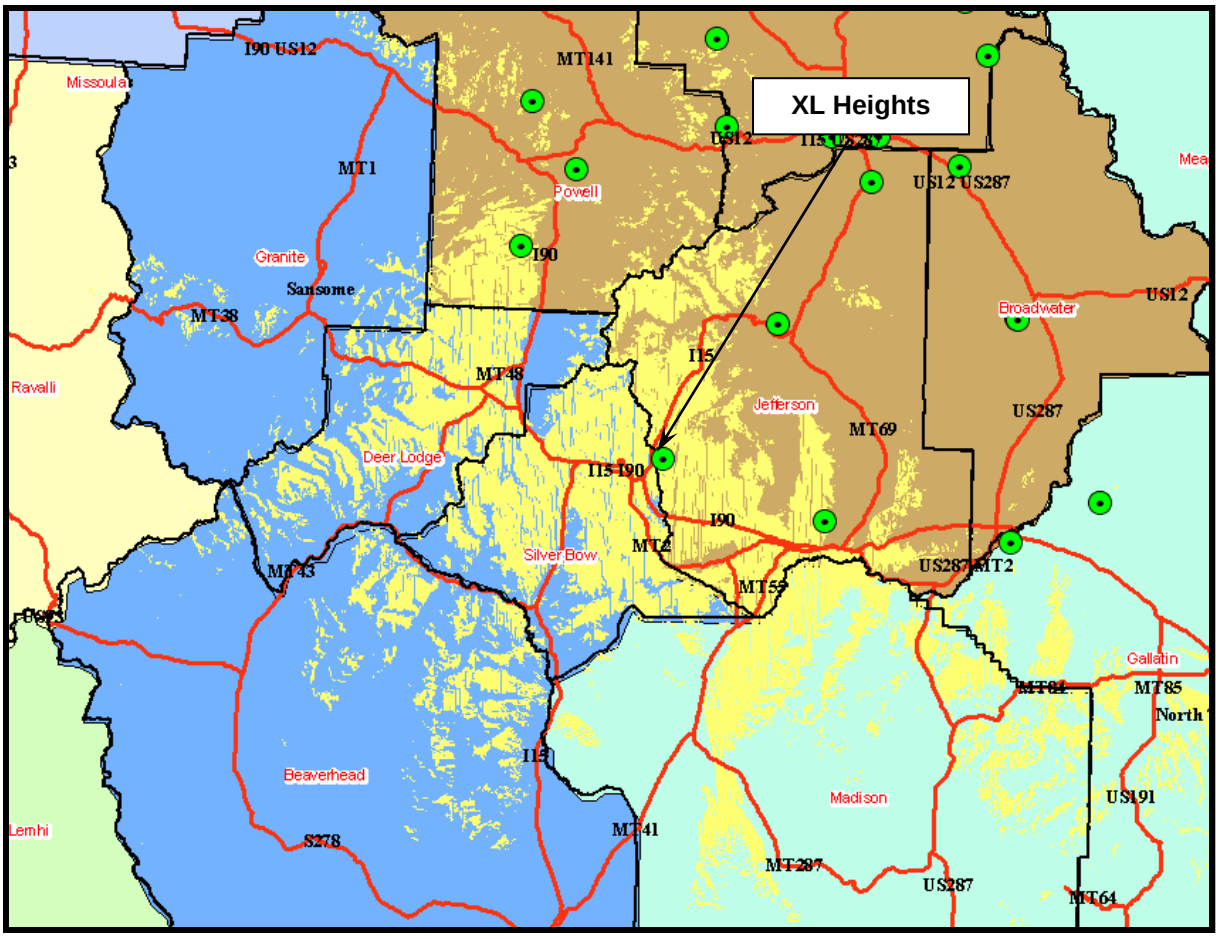

Figure 25 – Coverage Map: XL Heights

5.3.8 Montana City

Site Pictures

Site Description:

This site overlooks Montana City and shares the mountaintop with two cell company structures. The Sheriff has a separate room to the left of the picture of the door above. It is a new structure though very small. Good coverage but the tower would require upgrade.

Area:

Just south of Montana City

Owner:

Verizon Wireless

Elevation:

5565 ft.

Latitude:

46 30' 36.7"

Longitude:

111 55' 57.2"

Tower:

Old aviation beacon tower. Would require replacement.

Building Type:

Cinder block construction

Building Size:

6'x8'

List of Users at this site:

- Jefferson County Sheriff's Office

Radios at this site:

-

Coverage Map

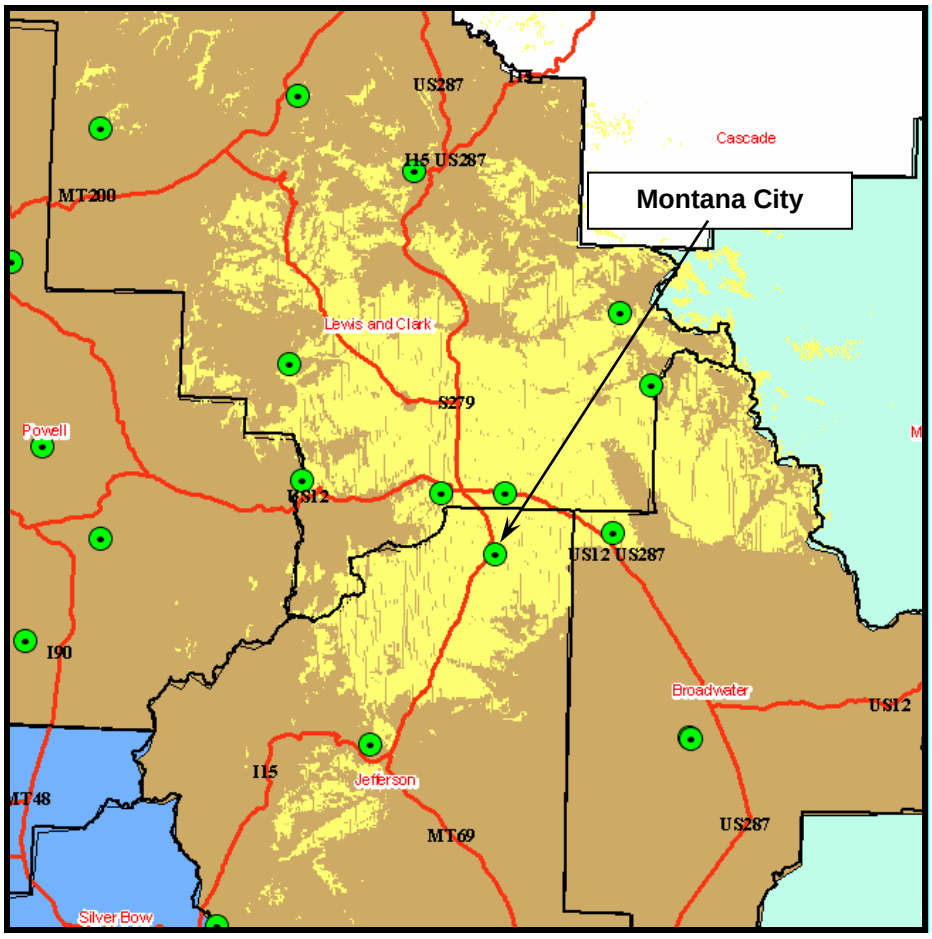

Figure 26 – Coverage Map: Montana City

5.3.9 Limestone Hills

Site Pictures

Site Description:

This site overlooks the Townsend valley area. It is the facility to the left in the above picture. It has excellent coverage for the area. One option that will need to be evaluated will be the possibility of moving the site up the mountain for added coverage.

Area:

South of Townsend in the limestone hills of Broadwater County

Owner:

BLM

Elevation:

5298 ft.

Latitude:

46 16' 51.7"

Longitude:

111 33' 32.9"

Tower:

Free standing 60 ft tower

Building Type:

Wood frame with metal sheeting. Core bond insulated. May require replacement.

Building Size:

8'x10'

List of Users at this site:

- Broadwater County Sheriff's Office
- Broadwater TV District

Radios at this site:

-

Coverage Map

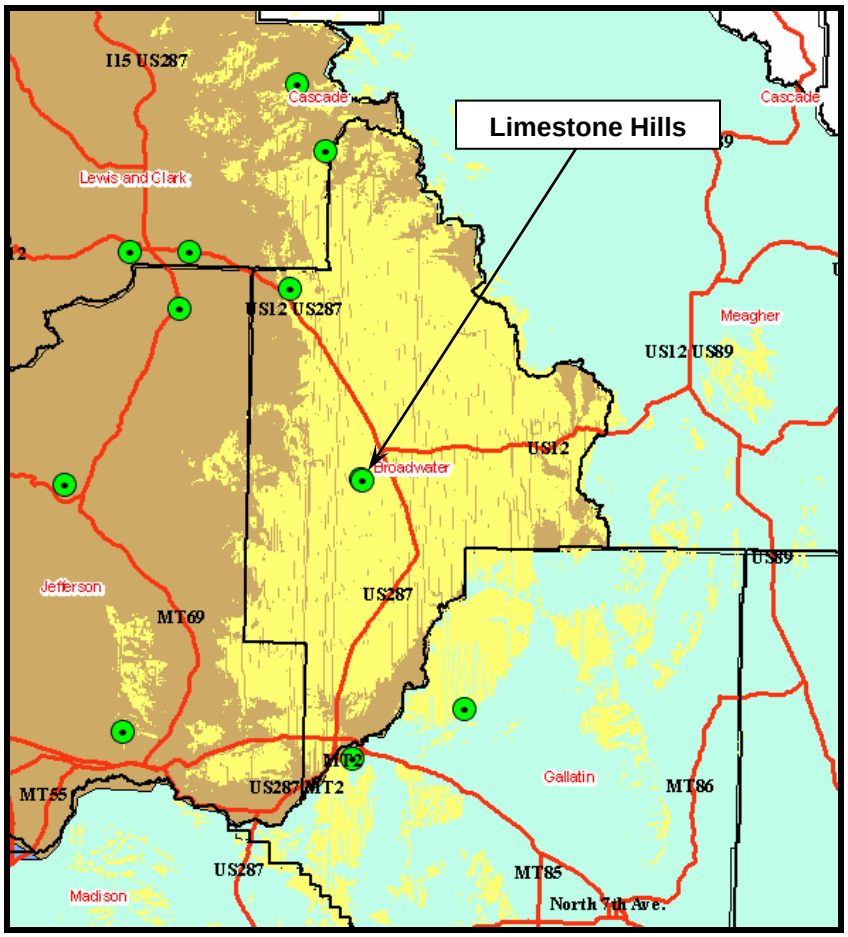

Figure 27 – Coverage Map: Limestone Hills

5.3.10 Nixon Ridge

Site Pictures

Site Description:
Nixon Ridge is a site in
Area:
Gallatin County, north of Logan
Owner:
Gallatin County
Elevation:
5640 ft.
Latitude:
45 57' 55.8"
Longitude:
111 20' 18.8"
Tower:
Free standing roughly 60 ft.
Building Type:
Modern communications structures
Building Size:
8'x10'
List of Users at this site:

-

Radios at this site:

-

Coverage Map

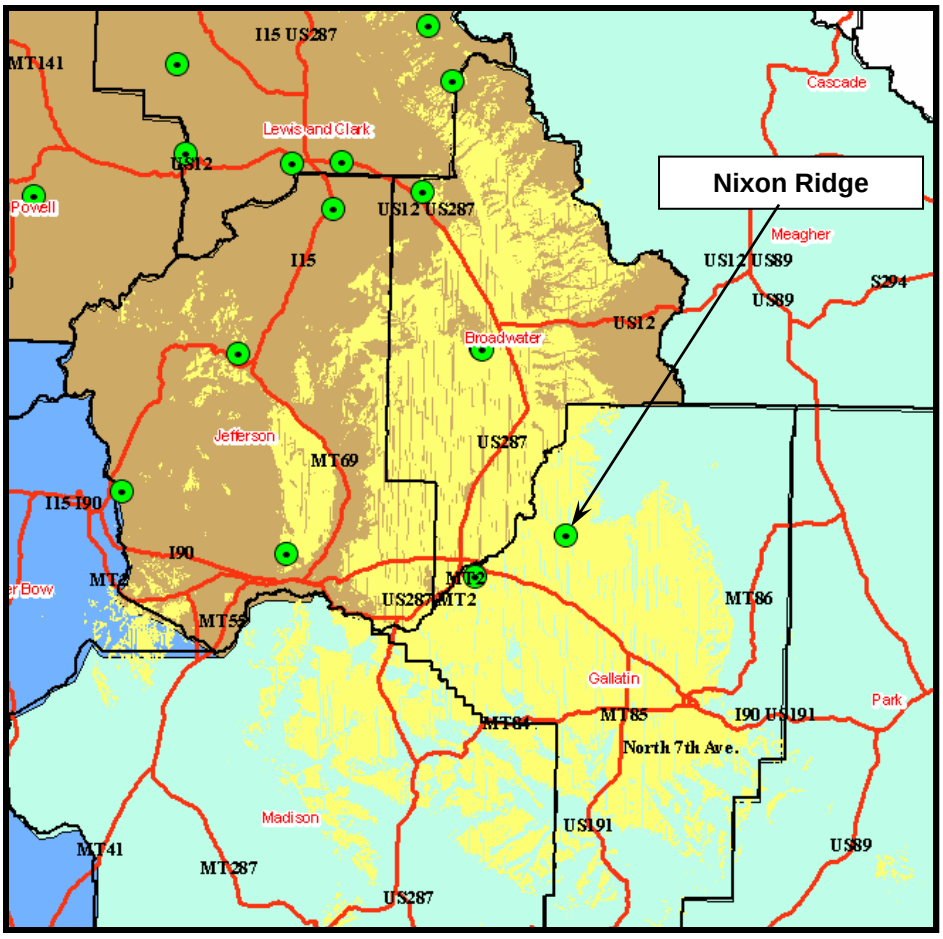

Figure 28 – Coverage Map: Nixon Ridge

5.3.11 Hogback

Site Photos:

Altitude:
AMSL 7776’
Latitude:
46^0 49’ 35.9”
Longitude:
111^0 42’ 46.3”

Site Description:
The Hogback site is used as a trunked site for Lewis and Clark County. This site is east of Helena and has excellent coverage in the region.
Area:
East of Helena
Coverage Map

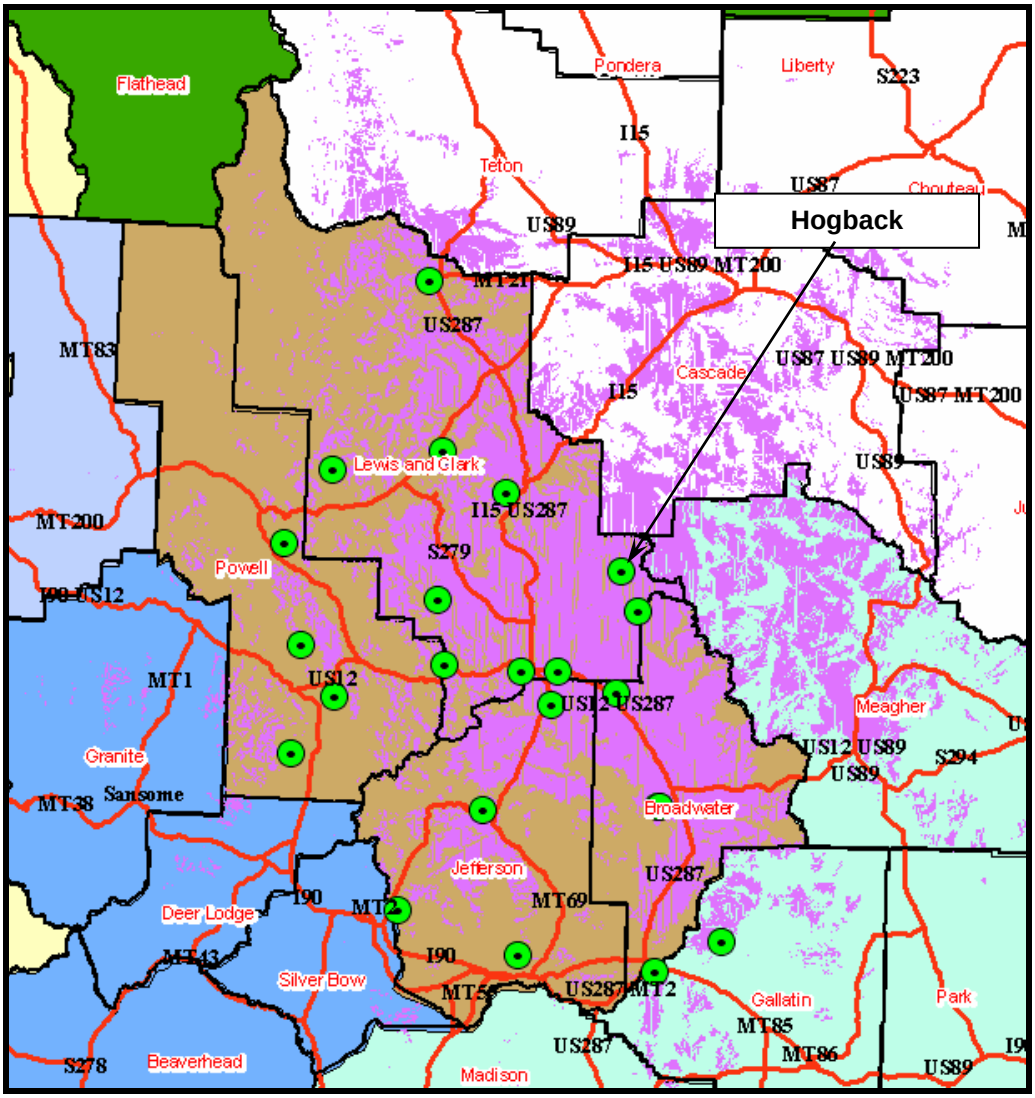

Figure 29 – Coverage Map: Hogback

5.3.12 Stonewall

Site Photo

Site Description:

The United States Forest Service (USFS) has an existing fire lookout tower constructed on Stonewall Mountain. The lookout currently houses solar-powered USFS radio equipment. The USFS has agreed to a shared use of the site location with Lewis and Clark County.

The upgrade project is currently underway and will include new communication equipment, shelter, and tower.

Area:

North of Lincoln

Altitude:

8335 ft.

Latitude:

N 470 02’ 38.3”

Longitude:

W 1120 42’ 11.5”

Coverage Map

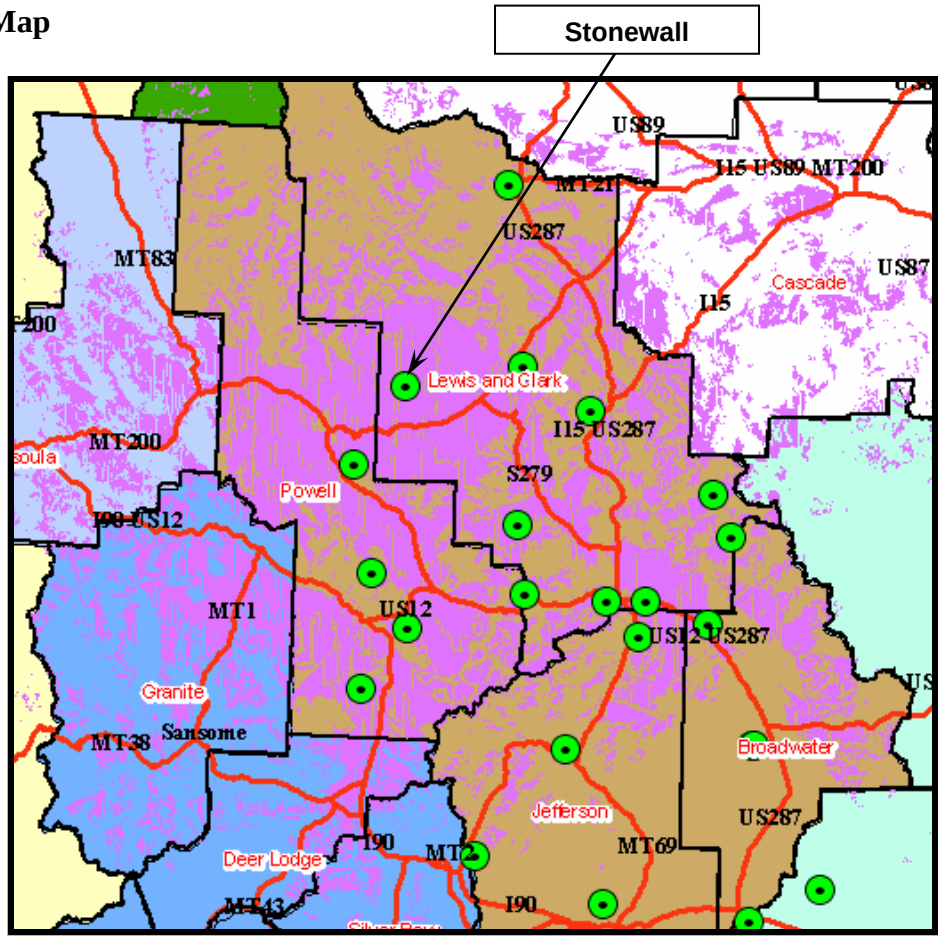

Figure 30 – Coverage Map: Stonewall

5.3.13 Pauly

Site Description:

This is a radio site that is being considered by the Northern Tier project for microwave backbone. Montana Highway Patrol may also have an interest in the site. Further detail will need to be gathered to determine if this site fits into the overall radio project for the area.

Area:

North of Deer Lodge near Garrison

Coverage Map

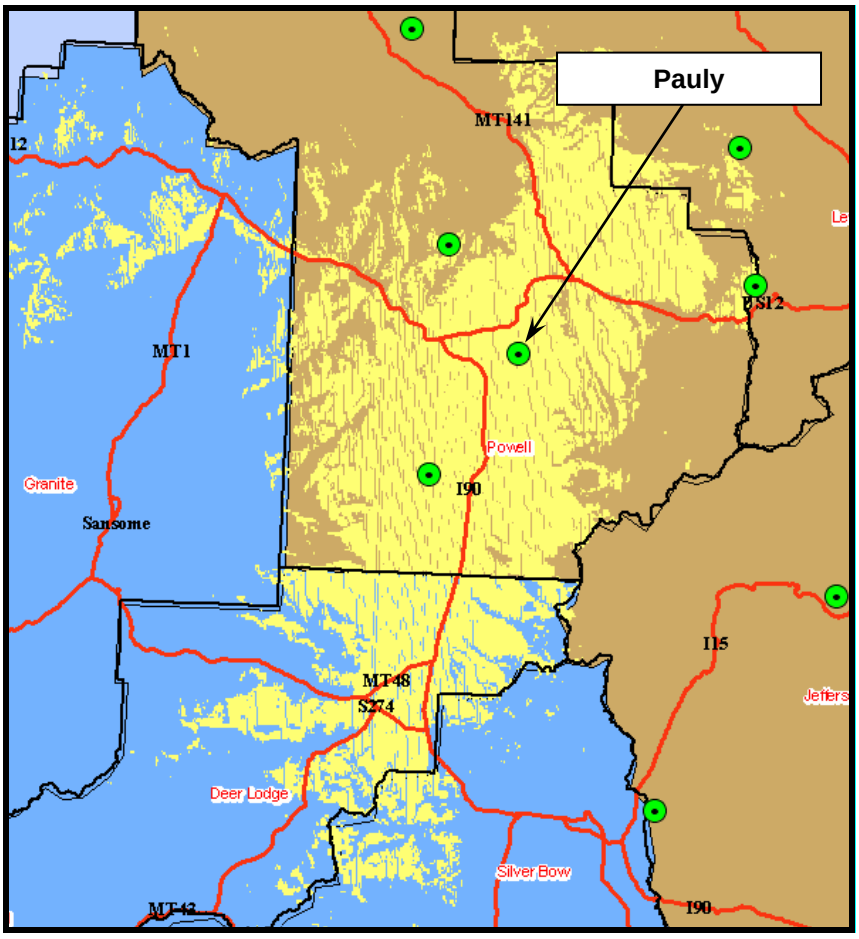

Figure 31 – Coverage Map: Pauly

5.3.14 Mac Pass

Site Photos

Site Description:

This is another key site to the Lewis and Clark County trunked system. It has excellent coverage and solid infrastructure.

Area:

West of Helena

Coverage Map

(Continued on next page)

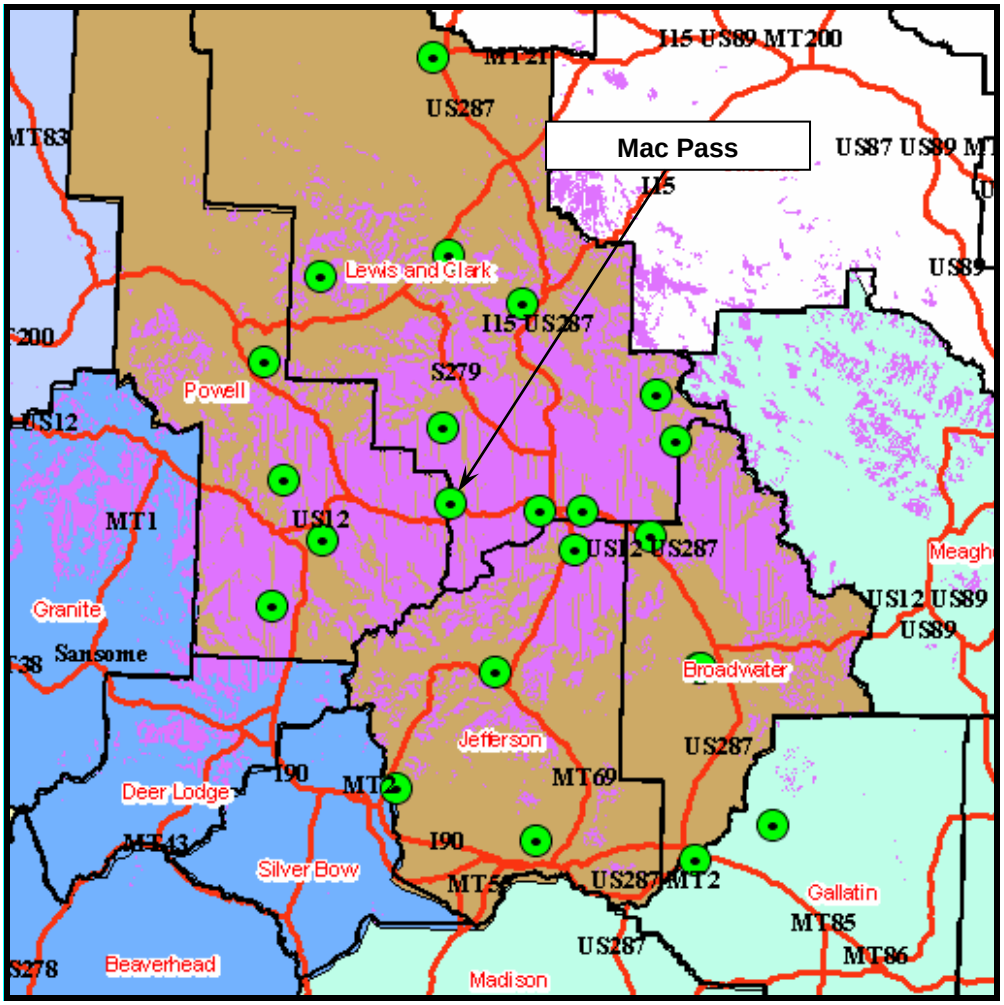

Figure 32 – Coverage Map: Mac Pass

5.4 Detailed Recommendations

Overall project success depends on the ability to demonstrate success on an iterative basis throughout the life of the project. Project tracking and reporting to show where success has occurred will build support for the project, not only stakeholder support, but also financial support.

Working collaboratively within the consortium and with others throughout the state will bring about the most effective plan, design and implementation of a system, not only for Tri-County but also for the other consortia and the state/region as a whole.

It is important to get something in the hands of people in each consortium. Radios are one way to do this.

5.4.1 Funding

It is critical for the success of this project that additional funding sources be identified and pursued. Funding is near the top of the list of concerns for every agency in Tri-County. A potential obstacle to a new system is cost, both in terms of equipment acquisition and on going maintenance and perceptions of it. Most users were aware of the potential costs of a next-generation system and seemed skeptical of the value especially when the cost of the next-generation equipment is more expensive than the cost of wide band conventional equipment.

Every day support for interoperable communication is growing. There are articles in newspapers and on television, which in turn seem to launch bills in congress and local government to improve interoperable communications. The country is further recognizing the need and importance of emergency responders being able to communicate with each other.

At the time of this writing, the project has only one revenue source: DES, or Homeland Security Grants. Additional funds would allow for further work into various steps of the strategy.

EMS may work through DPHHS to see about additional funding in that area.

Fire should work through existing grant resources but should coordinate all of equipment purchases at the consortium level.

Department of Corrections will also need to find funding sources. Homeland Security grant funding will not apply to DOC, as they are not a first responder. Infrastructure can be built that they use such as a site on Prison Hill, but the DES grants cannot be used for funding subscriber units for the DOC areas.

The following is a list of potential funding sources:

- FEMA – ICE Grants
- Homeland Security - WMD
- DPHHS - EMS
- Fire Grants
- National Guard
- Highway Traffic Safety
- Transportation (MDT)
- Legislature
- Congress

Other sources may be out there. Each discipline has more knowledge in their specific area.

The consortium will need grant funds to replace much of its equipment but each county or agency should also develop a capital improvements plan and set aside as many dollars as it can afford from various revenue sources, such as PILT, or general taxes. Local dollars may be needed to provide matching funds for grants or to fund items that a grant will not pay for, such as construction in the case of Homeland Security Grants.

5.4.2 Department of Corrections

The Department of Corrections presented a very different scenario to assess in this project. They are effectively a statewide agency, which has facilities in the Tri-County consortium region. This section will address many of the specifics that were discussed and documented during this phase of the project. The overall needs of the Department exceed the original scope of the project and would require a contract change to undertake. This work will be defined in a separate statement of work with additional costs defined is included as an addendum to this report.

Department of Corrections has many issues to resolve in regard to interoperable communications. The Montana State Prison Transportation department described scenarios whereby they transport inmates throughout the state with little or no communication with other agencies. Cell phones are the primary method of communication unless they are within range of the prison in Deer Lodge. They utilize mutual aid channels where possible. Poor equipment is a serious factor for them. Department of Corrections is also in the process of negotiating with private contractors for prisoner transport. There will need to be a formal communication plan developed to address the issues in the organization.

Montana State Prison works collaboratively with the Powell County Sheriff's office during emergencies. This collaboration works in both directions. There are times when the Sheriff's office needs assistance from the MSP Tactical Unit (SWAT). There are times when MSP needs assistance from the Sheriff's office to help with incidents. Currently the two agencies have a Memorandum of Understanding, which allows each to program their radios with the other's

frequency. This communication channel would not be effective in a large-scale incident. A formal communication plan needs to be developed between MSP and the Sheriff's office.

MSP operates internally on two frequencies with all tactical communication monitored by all radio operators. Every prisoner move is broadcast before moving and after arrival. This is to ensure that if someone gets in trouble, even a short transmission will be heard by someone and assistance can be provided. All non-critical radio transmission stops during an incident. The people interviewed feel that this system works very well, even in emergencies.

Treasure State Boot Camp operates independently from MSP, but seems to have very limited ability to communicate effectively with MSP. Scenarios were described where an inmate from Boot Camp escaped and could be seen by tower personnel with MSP and the two units could not talk directly on their radios. The Boot Camp does not use a repeater, only a mobile unit set up as a base station. Adding a repeater at the Boot Camp would increase the ability for the Boot Camp to communicate with MSP as well as the Powell County Sheriff's office.

At a high level, it is recommended that DOC formally adopt the SIEC definition for interoperable communication.

It is also recommended that the department formalize and centralize its radio communications functions under a manager who reports directly to the director. This person would lead a radio steering committee to coordinate the activities in the department. The radio steering committee would include members from each of the primary units of the department, which would help to focus the importance of radio communication. These people would understand how the existing communications system works (technical radio knowledge would not be required).

DOC should immediately form an alliance and/or contract for services with MHP, or a similar statewide agency, to utilize their statewide infrastructure for "emergency" assistance to the transportation unit until a statewide trunked system can be implemented. Other forms of day-to-day communication improvements should be investigated as well. Options such as cell phone antenna boosters, short term contract satellite phones, OnStar or a similar technology to allow transportation to communicate more effectively on the short-term basis.

Strategy for change:

1. Director establishes the vision with a few goals:
    - During a crisis
        - The Director and top managers can communicate with each other and the Incident Command Team in an encrypted mode, no matter where they are located in the state.
        - Incident Command Team can communicate, in an encrypted mode when needed with commanders from:
            - Local Law Enforcement
            - National Guard

    - EMS
    - Fire
  - Prison Transportation can communicate with the various facilities, Highway Patrol and Local Law Enforcement in all areas of the state.
  - Parole and Probation officers can communicate with state and local law enforcement agencies (officers)
  - Radio Communication strategy to be closely coordinated with the statewide interoperability project for public safety.
  - Utilize a team approach with DOJ, DOC, PSSB, DNRC, DOT, Consortium Radio Project Directors & National Guard to develop a budgetary request for the next legislative session to fund the communications upgrade
2. Conduct a capability assessment and implementation strategy. Scope of the assessment project is a broad needs assessment, gap analysis of where DOC is today and where the "users" want to be, high-level work plan to fill the gap and high level cost to implement it and includes a preliminary design.
3. To closely coordinate and take advantage of (leverage) the on going interoperability projects around the state to avoid duplication and share system components wherever possible.

The long-term solution for department of corrections seems to be a statewide trunked system.

5.4.3 Formal Communication Plans

To improve inter agency communications, it is important for all agencies to establish formal communication plans. Almost all agencies have various neighboring law enforcement, fire and EMS frequencies programmed into their radios now. However almost no one has a formal communication plan to be able to verify what is programmed and what is not.

Local and inter-county interoperable communications are dependant on each party having the other's frequencies programmed into their radios. This type of coordination is critical for everyone in a region to be able to communicate effectively. It is also important that the collaboration on frequencies is formally documented through a memorandum of understanding.

In particular, it is critical that local and county agencies work with DNRC and Forest Service to ensure that the local/county agencies have coordinated with the narrow band frequency migration that is underway. Tri-County should develop conventional frequency plans until a more advanced mechanism is available. This plan would include conventional frequencies and mutual aid channels.

This is also a scenario that would benefit from a centralized information system, ideally a database, accessible by each agency to coordinate frequencies and radio programming.

A single point of responsibility, (i.e. a central, responsible person) to:

- ensure radio frequencies are correctly programmed into radios

- ensure FCC licenses are kept current
- ensure radio sites are properly maintained
- research radio technology and recommend standards for radio purchases
- develop frequency plans
- review business practices to insure interoperability
- coordinate training for system users

The consortia should work closely with Lewis and Clark County and not rely on the local radio shop for all of these services. The Consortium should work on developing a well-accepted communication channel plan for the conventional system as a preliminary step, while waiting to deploy a new system. Mutual Aid (State Color channels) are used for interoperability but these sometimes fall short because coverage is limited to simplex communications. Where the topography of the county is better served by repeated channels a strategy to share repeaters during an emergency should be developed. Existing plans are limited to agencies within a county, plans to provide interoperability across the consortium is needed.

Another area that will require formal communication plans will be with private ambulance companies. There are several operating in or near the consortium as well as around the state. A plan needs to be developed, potentially through DPHHS, on how to deal with that aspect of radio communication system.

5.4.4 Business Practices and Training

Over one third of responders considered the area of business practices and dispatch practices to be of critical importance to communication improvements in the consortium. Lewis and Clark County radio users have echoed this message as a key element of the implementation of a new system. Formal business process review and documentation should start at the beginning of the next phase. This process can be very time consuming so it is important to allow time in the schedule for these activities.

Training should be provided to all levels of radio users on the following topics:

- Radios
- Procedures
- Dispatch
- Trunking

Lewis and Clark County will be a great resource to help establish training criteria and methods. Other states can be looked to for help in this area. Utah and Alaska may very well have been through these same steps recently.

5.4.5 Centralized Project and Frequency Management

It is the recommendation of Northrop Grumman that the next phases of this, as well as other ICP projects, be managed through a centralized Project Management Office (PMO). It will be critical to clearly define the role and responsibilities for this entity.

Project management is key to ensuring that site selection and development serves multiple consortia. Centralized project management will provide cost containment and cooperation that will result in lower costs.

Additionally this PMO could be the location for frequency management issues. A lack of VHF-high band spectrum to further expand the system (adding new radio channels) is a potential obstacle to deployment of a new system. Frequency licensing of needed spectrum should be a priority.

5.4.6 Project Directors

This group needs to continue its work to formalize procedures for working with other consortiums and establish a statewide implementation plan. Collaboration is the key to success. Working together will maximize the benefits from dollars spent.

Though this group had some difficulty in its early stages, the statewide consortium project directors are providing leadership for the statewide effort. This group has demonstrated the ability to come together with a common goal to drive the statewide effort forward.

The Tri-County Consortium will benefit from continued collaboration with DOT, National Guard, DOJ, DNRC, DOC, and DPHHS.

5.4.7 Inventory Standards

There is no standard in effect for inventory and most agencies do not maintain a formal inventory file. Most grants will require property management standards and records to be kept for verification. Property records should be centralized to the maximum extent possible along with finance records. A physical inventory should be taken bi-annually, on at least a random selection basis, to verify the equipment exists, what its current use is, and the need for the equipment. Control system(s) should be in place to prevent loss, damage, theft, etc. A method of tagging each item of equipment should be implemented.

Property records should be maintained to include the following equipment data:

1. Description (nomenclature)
2. Serial Number
3. Acquisition Date
4. Acquisition Cost
5. Source

6. Percentage of Federal Funds
7. Location use
8. Condition
9. Disposition Data (when taken out of service)
10. Sales Price
11. Fair Market Value

If a statewide equipment reallocation strategy is adopted, a full equipment inventory database would be the best solution. Other state agencies may have equipment-tracking databases that could be looked to for a model.

5.4.8 Paging

Paging related issues accounted for 16% of what responders felt was an important communications improvement. Paging was not considered to be within the scope of work for interoperable communications so no preliminary design work was done in that area. The issue should be addressed in each county and region to come up with specific improvements for those responders.

5.5 Preliminary Design

The system implementation will have to be taken in phases unless a significant revenue source is found. In order to allow for many funding sources, an overall implementation strategy has been devised. This is broken down into two sections: field units and site development.

The implementation strategy is broken down into 3 phases or stages that are based on funding, not time.

Phase 1: Set the Stage - Radios and Site Upgrades
This stage of the project is to ensure that basics standards are met in regard to site conditions and capabilities, which will make sites "microwave ready". It is also the stage for upgrading certain radios, both repeaters and field units.

Phase 2: Add Trunked Sites at each County Seat
The second stage adds microwave and trunking capabilities to sites overlooking counties seats, which are significant population centers, as well as dispatch centers.

Phase 3: Upgrade Additional Sites to Trunking Where Needed
This stage is where the system will go if the consortium has the funding necessary to build out a system that will satisfy the needs of everyone involved.

5.5.1 Subscriber Unit Upgrade Strategy

At the onset of the project, significant resistance to the entire project was based on concern over the costs for subscriber units. In several county meetings, users brought up costs for new trunking subscriber units in the $5000 range, compared to conventional pricing at less than $1000. Since that time, vendor competition has increased, and thus the cost for subscriber units has come down considerably. This will continue, as has been the case with all new electronic equipment. At the time of this writing, a base subscriber unit that is trunking upgradeable can be purchased for less than $1000. However, there are units with advanced features that can push the $5000 range. It all depends on the features that are added to the unit.

The recommended strategy for upgrades to field units is based on the incident command structure. Since the initial funding source is requiring P25 Trunking capable units be purchased with grant funding, it is recommended that command and control level users be provided with new units first.

The following table lists category levels which radios fall into that will help explain the types of field units out there and how they can be upgraded and used based on the ICS system.

Field Unit Level	Description	Minimum Standard
Category 1: P25 -Trunking Capable	P25 Trunking Capable	Deploy based on the ICS Command Structure first,
Category 2: P25 Conventional (Existing)	P25 Conventional (Non-Trunking)	*Phase out third*
Category 3: Newer -	Narrow band conventional	*Phase out second*
Category 4: Old	Wide band conventional	*Phase out first*
Encryption added to Category 1 Radios for ICS commanders and other users as decided at the consortium level – Encryption key(s) designated for statewide use carried in all radios.		

Figure 33 Field Unit Categories

New radio equipment is Category 1 type the consortium will develop a deployment strategy based on the Incident Command Structure. The "Trickle Down Strategy", or resource reallocation strategy, is used to re-deploy serviceable category 3 or 2 radios until all radios are a Category 3. This will help to ensure that all radios become narrow band in time for the changes that will be mandated by the FCC.

Specifically it is recommended that in the first stages of this project, fire remain as is, with the exception of command and control. This will continue until a complete system is operational or

until the various agencies are interested in moving more quickly. The consortium needs to prioritize the remaining functional areas of law enforcement, EMS, DES and public works.

New mobiles/portable radios are required to meet the Category 1 standard.
ICS Command structure determines sequence, Commanders should have encrypted radios.
Encryption strategy determined at Project Directors level.

Existing Category 3 radios are redistributed to replace Category 4 radios until all Category 4 radios are out of service. Then category 3 is phased out and finally category 2 radios phased out.

Replacement strategy: Agency, discipline, jurisdiction, consortium, other consortiums.

For example, Sheriff with category 3 radio passes this radio to replace a Category 4 radio and receives a new Category 1 radio.

This "Trickle Down" strategy will allow radios to be redistributed and the 1st milestone to be achieved. This same strategy can be used with repeaters, base stations and even towers.

It would be beneficial to all to develop an approved equipment list based on the WSCA contract.

http://www.aboutwsca.org/

As a final note on field units: It is becoming increasingly clear that the 2013 date for all units to be narrow band is not the date to look at. As the Forest Service and DNRC upgrade radios to narrow band in the coming year, all agencies that interface with them will need to narrow band, preferably before the next fire season.

5.5.2 Site Upgrade Strategy

Replace or upgrade sites to a certain level of standard that would include:

- Proper grounding
- Tower structural integrity
- Backup power capabilities
- Building capacity and environmentals

Geographic areas for coverage improvement are listed below:

Radersburg: This small remote community is on the border of the Elkhorn Mountains between Townsend and Boulder. They experience limited radio communication due to coverage issues. Potential solutions for improvement would include coverage from Nixon Ridge and Bull Mountain. If the Limestone Hills site were increased in elevation, it too may improve coverage in this area.

The Nixon ridge site would improve coverage for the area, but if operated in conventional mode, it would require that radios have sufficient capacity to add another channel. Many radios in use today have a very limited channel capacity and may not be able to carry a new frequency without giving up another equally important radio channel.

Southern Broadwater and Jefferson Counties: Broadwater emergency responders have limited coverage in this area. Again, Bull Mountain and Nixon Ridge would help in this area. The Three Forks volunteer fire department is contracted to respond to fires in the area. Further south, Jefferson County has remote areas that may have coverage from Gallatin or Madison county resources that may be utilized. Again, a cooperative effort, cross consortium boundaries may provide improvement in the area.

Elkhorn Mountains: A remote mountainous area that typically requires incident management communication capabilities such as fire and search and rescue operations. Responders in Jefferson and Broadwater Counties agreed that this area can have additional coverage brought in on an incident-by-incident basis with portable repeaters.

Deep Creek Canyon: A remote mountainous area that can experience improved coverage through a trunked system. Multiple sites coming in at different angles can add coverage here.

Basin, Elk Park Region: A remote mountainous area that has increasing residential population and a high rate of incident in camping areas.

The following table lists each of the sites in the consortium and the general upgrade path for the site. Sites upgrade path is selected based on coverage, current fundamental site conditions: power, building, tower, etc. The goal is to select sites that can fit together in a trunked system with overlapping coverage. Other sites will remain conventional based on available funding. The upgrade plan incorporates adding repeaters to the existing CDP I system to improve coverage and interoperability in all counties in the consortium.

Powell	**Prison Hill**	Conventional - connect to Trunked System
	Cominco	Keep conventional
	Ogden Mountain	Keep conventional
	Utilize existing Pauly site	details below
Jefferson	**Free Enterprise**	Trunked Site - Phase 2
	Bull Mountain	Possible Trunked Site - Phase 2
	XL Heights	Keep Conventional
	Montana City	Possible Trunked Site - decision to develop coordinated with Lews & Clark coverage
Broadwater	**Limestone Hills**	Trunked Site - Phase 2 Upgrade entire site
	Utilize existing Bull Mountain	details above
	Nixon Ridge	Phase 1: Develop to conventional, Phase 3 Connect to trunked system
	Beacon Hill (Spokane Hills)	Keep conventional
Utilize Existing Trunked Sites (add repeaters)		
	Hogback: Northern Broadwater and Jefferson	Add repeater
	Stonewall: Northern Powell	Add repeater
	Mac Pass: Northern ALL	Add repeater
	Pauly Site: Southern Powell	Trunked Site - Phase 2

Figure 34 – Tri-County Consortium Site List

5.5.3 Site Development Cost Estimate

This section contains a summary of the costs per site of the preliminary design and a total for the consortium.

The total estimate for the entire consortium for implementing a Hybrid P25-Conventional/Trunked system is listed below. This includes not only the costs for each site (which are detailed in the Appendix), but labor for installation and licensing costs for repeater frequency pairs. Licensing and labor costs for the microwaves are included in the cost for the microwaves.

***NOTE:** The following list of sites does not contain information on **Red Mountain**, a potentially beneficial site under development by the 15/90 Consortium. This site should be investigated during the design phase.*

Powell County

Prison Hill Conventional - connect to Trunked System Phase 2

Grounding	$10,000
Building	$25,000
Tower	$160,000
Generator	$10,000
2 Repeaters	$40,000
Combiner, site controller	$40,000
Tie into trunked system	$11,000
Total:	$296,000

Cominco Keep conventional

2 Repeaters	$40,000
Tie into trunked system	$11,000
Total:	$51,000

Ogden Mountain Keep conventional

Repeater	$20,000
Tie into trunked system	$11,000
Total	$31,000

Pauly site details below

Jefferson County

Free Enterprise Trunked Site - Phase 2

Grounding	$10,000
Tower	$160,000
Generator	$10,000
Repeaters	$60,000
Microwave	$255,000
Combiner, site controller	$46,000
Trunking upgrade	$90,000
Total:	$631,000

Bull Mountain Possible Trunked Site - Phase 2

Repeaters	$60,000

Microwave (2 hops)	$170,000
Combiner, site controller	$46,000
Trunking upgrade	$90,000
Total:	$366,000

XL Heights Keep Conventional

Repeater	$20,000
Tie into trunked system	$11,000
Total:	$31,000

Montana City Possible Trunked Site - Phase 2 - Decision to develop coordinated with Lewis & Clark coverage

Tower	$160,000
Repeaters	$60,000
Microwave	$85,000
Combiner, site controller	$46,000
Trunking upgrade	$90,000
Total:	$441,000

Broadwater County

Limestone Hills Trunked Site - Phase 2

Grounding	$10,000
Building	$25,000
Tower	$50,000
Generator	$10,000
Repeaters	$60,000
Microwave (2 hops)	$170,000
Combiner, site controller	$46,000
Trunking upgrade	$90,000
Total:	$461,000

Bull Mountain Utilize existing site – details above

Nixon Ridge Phase 1: Develop to conventional
Phase 3 Connect to trunked system

Repeater	$20,000
Connect to trunked system	$11,000
Total:	$31,000

Beacon Hill (Spokane Hills) Keep conventional

Connect to trunked system	$11,000
Total:	$11,000

Utilize Existing Trunked Sites (add repeaters)

Hogback: Northern Broadwater and Jefferson Add repeater

Repeater	$20,000
Trunking upgrade	$30,000
Total:	$50,000

Stonewall: Northern Powell Add repeater

Repeater	$20,000
Trunking upgrade	$30,000
Total:	$50,000

Mac Pass: Northern ALL Add repeater

Repeater	$20,000
Trunking upgrade	$30,000
Total:	$50,000

Pauly Site: Southern Powell Trunked Site - Phase 2
This site is not currently trunked, but has the potential of being in the microwave loop for Northern Tier.

Repeaters	$60,000
Combiner, site controller	$46,000
Trunking upgrade	$90,000
Total:	$196,000

Dispatch upgrades:

Boulder	$24,000
Deer Lodge	$24,000
Townsend	$8000
Total:	$56,000

Project Management:	$275,200
Frequency Management:	$200,000

Total Site Development Costs	**$3,227,200**

It cannot be emphasized enough that these estimates should be taken as nothing more than a rough order of magnitude. It is not possible at this point in the project to come up with

anything more exact. There are far too many variables, which are not and cannot be known at this time. The reader is strongly encouraged to make careful note of the assumptions made during the costing process. Without that knowledge, the estimate is meaningless.

A number of assumptions and caveats are associated with this preliminary design. The Project Manager worked with representatives from the consortium, Lewis & Clark County and Motorola to create this preliminary design. Additionally, the Project Manager drew on the experience of the Northern Tier Interoperability Consortium to refine the costing assumptions used to derive the estimate.

It is critical that this work be centralized through project and frequency management to ensure that what one consortium is building works with another consortium where possible. Nixon Ridge, Bull Mountain, XL Heights and several others border, or reach well into other consortia.

Completion of site surveys at the engineering level is beyond the scope of the baseline assessment. Sites were surveyed for obvious problems and basic details. Photos of each site are located on the CD that accompanies this report. The development of site survey criteria is also beyond the scope of the baseline assessment presented here. The criteria will have to be developed during the implementation phase but would include some generally applicable and logical considerations:

- Topography as it relates to transmission efficiency.
- Road access as it relates to equipment needed for site upgrade/improvement
- Electric power requirements for upgraded site.
- R-56 or other grounding standards
- Microwave link capability.
- Screening potential of existing vegetation, structures and topographic features.
- Compatibility with adjacent land uses.
- The least number of sites to cover the desired area.
- The greatest amount of coverage, consistent with physical requirements.
- Opportunities to mitigate possible visual impact.

It cannot be emphasized enough that this is preliminary coverage data. It is critical that in the design phase an in depth engineering analysis be completed to ensure that adequate coverage is provided for local needs. This can best be accomplished through a statewide project management office.

5.5.4 Proposed System Coverage Map

The following figure displays the proposed system coverage map.

- Tri-County site coverage in yellow (including new sites)
- Lewis and Clark County coverage in purple

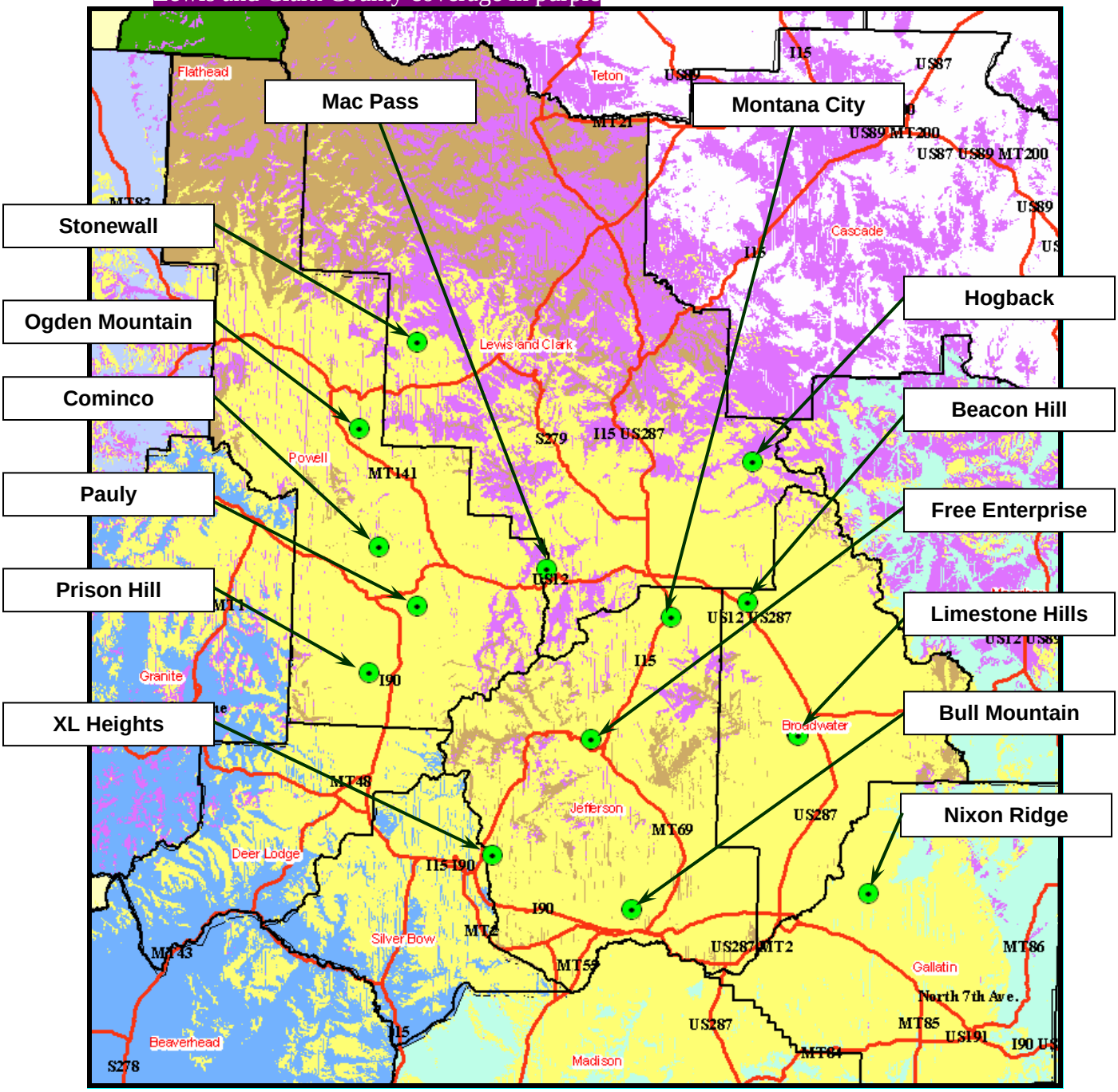

Figure 35 - Planned Sites and Coverage

The coverage map shown here is not to be relied upon for guaranteed coverage. Full engineering coverage maps should be created for each site during the design phase using exact site details. In addition to coverage maps, it is recommended that field-testing be done for several areas to ensure coverage.

5.5.5 Subscriber Unit Cost Considerations

The subscriber unit upgrade strategy defined above has been adopted by the consortium and very likely will be adopted by the Project Directors. Costs for P25 Trunking capable radios range from $1500 to $5000 or more depending on options and capabilities.

Combined County Equipment

	Portable						Mobile						Base Station or Repeater					
	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total
Law Enforcement	4	11	32	7	7	61	4	0	22	15	14	55	5	0	7	6	0	18
Fire	4	38	51	78	19	190	0	8	25	29	18	80	0	0	2	4	0	6
EMS	0	0	14	26	18	58	2	0	3	7	9	21	1	0	0	1	0	2
SAR	0	0	29	9	0	38	1	0	0	4	3	8	0	0	0	0	0	0
Pub Wks	0	0	4	0	16	20	0	0	35	41	4	80	0	0	6	8	0	14
DES	0	0	1	3	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Schools	0	0	5	0	0	5	0	0	7	0	0	7	0	0	1	1	0	2
Totals	8	49	136	123	60	376	7	8	92	96	48	251	6	0	16	20	0	42

Portables	8	49	136	123	60	376
Mobiles	7	8	92	96	48	251
Repeaters & Base	6	0	16	20	0	42
Total Equipment	21	57	244	239	108	669

Total Category 1	21
Total Category 2	57
Total Category 3	244
Total Category 4 & Unknown	347

DOC	Portable						Mobile						Base Station or Repeater					
	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total	Category 1	Category 2	Category 3	Category 4	Unknown Category or Not Compatable	Total
Treasure State (Boot Camp)				22		22			16	69		85			2	27		29
Prison			178	56		234			14	108		122						0
MCE			15			15			6	7		13			1	1		2
Riverside (Boulder)					32	32					4	4						
Total	0	0	193	78	32	303	0	0	36	184	4	224	0	0	3	28	0	31

Figure 36 – Tri-County Consortium Inventory Totals

To give the reader an idea of the magnitude of the costs involved, there are roughly 300 radios that cannot be narrow banded in the three counties, and another 200 in the Department of Corrections agencies involved in the survey.

This summary does not include information from Riverside. The data from Powell County is not complete and will be needed for the next phase of the project.

The plan is for a formal review of all agency radios upgrades to be processed in the next phase of the project. Funding and need will be the driving factors and will be used by the Project

Directors to allocate funds according to need described in this document as well as discussion in Project Director Board meetings.

Specific costs for upgrading subscriber units is difficult to establish as not all radios need to be replaced and accurate information regarding what needs to be replaced is not readily available. One of the goals of this report is to prepare the consortium for funding sources that will use the information contained here. To support that goal it was determined that some sort of figure was necessary to include.

Three options for replacement of radios are shown below. The radio pricing is based on Motorola XT(S/L) 2500 and XT(S/L) 5000 pricing. It is only a very rough estimate. These numbers can also be potentially reduced by further evaluation of individual needs in regard to encryption. Identifying who needs encryption and who does not can save money. New models are coming out and prices are changing. This should be considered a high-end estimate. Details of the calculations are available in *Appendix B Radio Inventory Summary.*

Option 1:	Replace minimum "command" level radios	**$224,000**
Option 2:	Replace all "Category 4" and "unknown" radios with new (allows for narrow banding)	**$2,081,000**
Option 3:	Replace all radios with new	**$3,852,000**

5.5.6 Assumptions and Caveats

1. It is assumed that all counties will want to keep their existing equipment and frequencies. As a result, this preliminary design assumes new equipment for the P25, trunked system.

2. The assumption was made to use existing sites, towers, and buildings whenever possible. In order to come up with a worst-case scenario from a costing perspective, those sites deemed incapable assume erecting a new tower and building at each site, unless indicated otherwise in the detail for each site.

3. Costs for renting land or towers are not included in the estimate.

4. The individual estimated costs used to derive the site estimates are as follows:

Estimated Pricing	
$10,000	Generator
$10,000	Grounding
$25,000	Building
$160,000	Tower - 100 ft
$50,000	Tower - 30 ft
$20,000	P25 Trunk CAPABLE Repeater and Antenna
$30,000	Add trunking to site with existing trunk capable repeaters (per repeater)
$6,000	Site controller
$85,000	Microwave - 1 hop
$40,000	Combiner equipment
$11,000	Connect to Trunked System
$8,000	Consollette Base Station
$2,000	Dispatch Trunking Upgrade
$2,000	Frequency Acquisition - Per Pair

Figure 37 – Equipment Pricing List

5.6 Letters of Support

Letters of support for the efforts and goals of the consortium were received from the following stakeholders:

- Broadwater County Sheriff's Office
- Powell County Sheriff's Office
- Montana City VFD
- Jefferson County Office of Emergency Management
- Jefferson County Sheriff's Office
- Boulder Police Department
- Boulder Ambulance Service
- Basin Quick Response Unit
- Jefferson City VFD
- Townsend Schools
- City of Townsend
- Broadwater Rural Fire District
- Broadwater County Search and Rescue

5.7 Risks

- Lack of funding
- Lack of stakeholder buy-in and commitment

These two factors are the primary obstacles to the project. Funding is the key to the project. The Homeland Security Grants are the primary source of funding, but other sources of funding need to be found.

Lack of stakeholder buy in is not currently a problem, but it has the potential for high impact if it were to wane. By having a good common sense implementation strategy, stakeholder buy in will be increased. Keeping the momentum and maintaining the level of interest that has been developed over the past several months is important. This can be done through demonstrated success, small wins, throughout the project.

Some degree of autonomy is relinquished when a shared communications system is implemented and sometimes parochial interests may be an obstacle in establishing a shared system. The system will only be as good as the extent of its acceptance, therefore a strategy to ensure continued communication among all the users is essential through local groups like the radio steering committee while searching for funding.

5.8 Next Steps

Prior to moving on to the design and implementation phase, it is critical that detailed information be gathered in regard to subscriber units, sites, frequencies and exactly what is used at each site. Information that is more detailed will ensure that good decisions are made, and ultimately that funding is used as effectively as possible.

There are still quite a few subscriber units listed in the “unknown” category. It is very possible that there are newer radios that do not need replacing in this category. That will ultimately save money.

Site survey at the engineering level is beyond the scope of the baseline assessment. Sites were surveyed for obvious problems and basic details. Photos of each site are located on the CD that accompanies this report. The development of site survey criteria is also beyond the scope of the baseline assessment presented here. The criteria will have to be developed during the implementation phase but would include some generally applicable and logical considerations:

1. Topography as it relates to transmission efficiency.
2. Road access as it relates to equipment needed for site upgrade/improvement

3. Electric power requirements for upgraded site.
4. R-56 or other grounding standards
5. Microwave link capability.
6. Screening potential of existing vegetation, structures and topographic features.
7. Compatibility with adjacent land uses.
8. The least number of sites to cover the desired area.
9. The greatest amount of coverage, consistent with physical requirements.
10. Opportunities to mitigate possible visual impact.

Dispatch centers will also need further investigation in regard to radio consoles and base station connectivity to the overall radio system. PSAPs and 911 centers were not part of this scope of work but will need to be integrated into the overall dispatch upgrade plan.

5.9 Contents of CD – Electronic Documents

- Motorola Coverage Maps – Images
- Motorola Coverage Maps – GIS Data
- Site Photos
- Electronic version of this document
- Broadwater County Binder Documents
- Meeting Notes
- Radio Inventory
- Completed Questionnaires

5.10 Addendum – Department of Corrections: Parole and Probation Needs Assessment

This section will be added upon completion of the additional needs assessment specifically for Department of Corrections units.